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MISA

STOPPING WATER POLLUTION AT ITS SOURCE

MISA
Municipal/Industrial Strategy for Abatement

EVALUATION OF MUNICIPAL SEWER USE CONTROL OPTIONS - PHASE 1 CONTROL PRACTICES IN EUROPE, USA, CANADA AND JAPAN

Ontario
Ministry of the Environment
Jim Bradley
Minister

MUNICIPAL-INDUSTRIAL STRATEGY FOR ABATEMENT
(MISA)

EVALUATION OF MUNICIPAL SEWER USE

CONTROL OPTIONS - PHASE I

CONTROL PRACTICES IN EUROPE, USA, CANADA AND JAPAN

Prepared for Environment Ontario

by

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EXECUTIVE SUMMARY

The control of sewer-use has been reviewed in jurisdictions in North America, Europe and Japan where control of discharges of waterborne industrial wastes has reached a sophisticated level. The countries contacted were United States, United Kingdom, France, Germany and Japan. In addition the Canadian approaches were reviewed across Canada. The control options identified were subjected to a screening process to develop a list of control options for the detailed comparative analysis in the second phase of this study. In all, eight control options were identified for further study.

The control options for further study are all supported by data obtained by interviewing agencies responsible for setting, implementing or enforcing regulations. Four options for further study were identified from the USA, Germany and France. Four other hybrid options were identified from the data collected from these countries. These included the United States approach typified by their National (Categorical) Pretreatment Program.

The information required for the identification of the control options was obtained by personal interview of the agencies involved in various aspects of their control programs.

In the process of gathering this information, overview information on the legal/regulatory system was obtained and is presented in this report. In addition, the jurisdictional authority for sewer use control in Ontario was reviewed and is presented in this report. These overviews will provide the appropriate context for the detailed evaluation to be completed in Phase II.

In order to identify the scope of the sewer use control problem in Ontario, data was reviewed on the sources and quantities of sewage produced and treated in Ontario. A summary of the information provides an understanding of the scope of sewer use control problem.

Finally the approach to the detailed evaluation is provided as an introduction to the Phase II studies. An effectiveness cost analysis will be carried out. General descriptions of the effectiveness criteria are provided.

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1. INTRODUCTION

1.1 MISA Program

The Municipal-Industrial Strategy for Abatement (MISA) was announced in June 1986 by the Minister of the Environment in the form of a White Paper[1]. The White Paper was subtitled "A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters". This subtitle fairly summarized the scope of the White Paper and the goal of the MISA program was clearly stated early in the document:

> "MISA's ultimate goal is the virtual elimination of toxic contaminants in municipal and industrial discharges into waterways."

This goal will be realized through an abatement program that deals with specific toxic contaminants by regulating their discharge at source in a uniform program across Ontario.

The specific contaminants are being identified in a program that selects target compounds from a large number of candidate chemicals. In order to produce a control program that is manageable and effective, a screening process is underway[2]. This process will identify chemicals that are:

- known to be used and released into the Ontario environment;

- known to cause toxic responses in man, animals (including aquatic biota) and plants; and

- present in the Ontario environment.

The development of this list[2] involves a hazard identification and assessment process embodying the foregoing. What results is the Effluent Monitoring Priority Pollutant List (EMPPL) which is one of the bases for regulatory actions under MISA.

The regulation of discharges at source will be accomplished through two types of regulation: monitoring and effluent limits regulations.

Monitoring Regulations

Monitoring regulations will require effluent monitoring of all municipal and industrial direct discharges to surface water. The monitoring will be the dischargers responsibility with provision for policing mechanisms to ensure data integrity.

Effluent Limits Regulations

The regulations will cover direct discharges to surface waters: the direct industrial dischargers and the municipal sewage treatment plants. In the case of municipal sewage plants, control of industrial discharges into sanitary sewers will also be considered. The MISA initiative relative to direct and indirect dischargers is amplified in Section 1.2 below.

This study, "Evaluation of Sewer Use Control Options", explores the options available to the Province and the municipalities to control the discharge to (or use of) municipal sewers. This study addresses the cost,

achievability and effectiveness of the various options as exhibited by experience in the United States, Europe and Japan.

Other important features of the MISA effluent limits regulations for direct discharges are:

- the use of control technology as the basis of abatement regulations;

- the parallel use of water quality impact assessment to supplement control technology;

- uniform applicability of the regulations.

The control technology approach looks to Best Available Technology Economically Achievable (BATEA or BAT) as the prime basis of regulation. Water quality impacts of the technology based discharge limit will also be assessed. The more stringent approach of BAT performance or water quality assessment will be used in the abatement regulation.

The uniform applicability feature of the control technology approach will ensure that no special advantages are bestowed on a geographical location. The impact assessment will consider sensitive and confined water bodies as special cases for impact assessment. If special monitoring and discharge limitations are indicated, these will become the regulations in these special areas.

Consultation and Public Participation

The full participation of affected municipalities, industries and the public is a vital aspect of the MISA program. Some aspects of this participation will include:

- An advisory committee (MISA Advisory Committee) including public interest group representatives, will review draft regulations and provide advice and recommendations to the Minister.

- Industrial and municipal cooperation on pre-regulation effluent monitoring programs.

- Individual sector technical committees to support MISA program development.

- A formal public review period for public review of, and comment on, the draft regulations.

- Complete public access to data on contaminant discharges to surface waters and on the effluent limits set for all dischargers.

1.2 Scope of MISA: Direct and Indirect Dischargers and Contaminant List

Direct Dischargers

The direct dischargers of wastewater to surface water in Ontario comprise 300 industries and approximately 400 municipal sewage treatment plants. The sewage treatment

plants in Ontario accept waste from some 12,000 industries. The MISA program will initially consider the direct dischargers in eight industrial sectors.

- petroleum refining
- organic chemicals
- pulp and paper
- metal mining and refining
- iron and steel
- electric power generation
- inorganic chemicals
- industrial minerals

Two hundred of the 300 direct dischargers will be covered by regulations in these sectors. The Ministry plans to cover the remaining direct dischargers in a latter phase of the MISA initiative. The industrial category regulations (monitoring and abatement) are to be developed with pre-regulation consultation and cooperative monitoring. Technical subcommittees established by industrial sector and for the municipal sector have been established to coordinate these studies.

Indirect Dischargers

At present the control of indirect discharges to the Province's waterways, i.e. the industrial users of the municipal sewer system, have been controlled by local municipal by-laws which concentrate on conventional parameters. These include parameters addressing bio-degradability, suspended solids, ammonia, phosphorus, some metals, oils, grease and phenols. The 1975 Model Sewer Use By-Law did include some heavy metal restrictions and several

municipal by-laws also control metals. Fire/explosion hazards and sewer obstruction are also addressed, but toxic organic contaminants have largely been ignored. A general provision against discharging material that "may be or may become a hazard to persons, animals or property" suggests protection of workers in sewage plants and others affected by sludge disposal or volatilization in air. A new model by-law (April 1987) has strengthened this provision. This current regulatory situation is discussed in more detail in Section 1.3 below.

In responses to the MISA White Paper (Ref. 3, p.34), Environmental advocacy groups maintained that the indirect discharge represents as great an environmental concern as the direct discharges. The Ministry agreed. To this end the public wants to see BAT considered for indirect discharges, i.e. this study must consider pretreatment standards for indirect dischargers. Also falling out of this concern was the requirement to assess the need for assistance in enforcement activities currently carried out by municipalities.

The exemption of municipal pollution control plants from provisions of the Water Resources Act was removed under Bill 112 which was given Royal Assent 86/12/18. This Bill also binds Crown agencies to the provisions of the Environmental Protection Act.

A concern that municipal pollution control plants are not designed to manage toxics, organics and metals was raised by the public[3].

The USEPA in its "Report to Congress on the Discharge of Hazardous Wastes to Publically Owned Treatment Works - February 1986"[4] evaluated 47 industrial categories and identified 160,000 industrial and commercial facilities in

the United States that discharge wastewater containing hazardous constituents to Publically Owned Treatment Works (POTWs). The study also estimated that between 82 and 92% of the hazardous constituents could be removed from the waste stream by POTWs.

Findings on sludge and water quality impacts showed that the significant effects are associated with the toxicity and characteristics of specific pollutants and not just the quantities of pollutants entering the environment. POTWs can therefore only be considered effective for removal of toxics when viewed in conjunction with a comprehensive industrial pretreatment program.

The Ministry of the Environment's long-term goal of "virtual elimination of toxics" into water bodies will therefore have to include control of toxics discharged to municipal plants. This aspect of MISA will be addressed by this Sewer Use Control Options Study.

Contaminants List

The emphasis on toxic contaminants was also provided by the list of target parameters, compounds and metals provided in Appendix 1 to the Terms of Reference for this study and included as an appendix to this study (Appendix 1). The list can be summarized as follows:

- 15 Conventional Parameters
- 18 Heavy Metals
- 151 Organic Compounds:
    - 46 Volatiles - Chlorinated, Non-Chlorinated and Water Soluble
    - 56 Extractables-Base/Neutral and Acidic

47 Extractables, Chlorinated Industrials, Chlorinated Hydrocarbons, Phenoxy Acid Herbicides, Organophosphorous Pesticides, Carbamates and Triazine Herbicides

2 Chlorinated dioxins and dibenzofurans.

The Effluent Monitoring Priority Pollutants List (EMPPL) was published for comment by the Ministry of the Environment in March of 1987 and reflects a more comprehensive coverage of toxics than was given in the Terms of Reference. The EMPPL is also reproduced in an appendix to this report (Appendix 2).

The effectiveness of various sewer use control options in reducing the access of the chemicals (toxic organics and heavy metals) on the EMPPL to waterways and the environment at large is to be used as a criterion for assessing and evaluating the options.

It is noted that the EMPPL does not include conventional parameters, pesticides or parmaceuticals. Conventional parameters are, of course, considered in assessing control program effectiveness; pesticides and pharmaceuticals are specific contaminant prohlems not usually considered in industrial discharge control.

1.3 Objectives of This Study

The objectives of this study are:

- to assess alternatives for control of industrial and domestic use of municipal sewers;

- to suggest a number of viable control options, along with their advantages and disadvantages, which can be subjected to debate and scrutiny by the public, industrial sectors and municipalities before the selection of the preferred option for Ontario.

Current municipal sewer use by-laws in Ontario are aimed at avoiding:

- damage to the sewer system through blockage and clogging problems
- nuisance odours or foaming
- hydraulic overloading
- organic overloading or process upsets at the sewage treatment plant and
- adverse impacts on sludge quality relative to the sludge disposal method.

Little attention has been given in Canada to controlling industrial discharges to sanitary sewers or limit the eventual discharge of toxic organic compounds from municipal sewage treatment plants to the receiving water body.

The draft Ontario Model By-Law (Appendix 3) to control waste discharges to municipal sewers (April 1987) addresses control of toxic compounds with a general provision against discharging material that "may be or may become a hazard to any person, animal, property or vegetation". This new model is more specific on the sludge provisions than the former model by-law and is intended to protect sewage plant workers and the air through the general provision of protecting people, animals, property and vegetation. Furthermore, the new by-law prohibits discharge of:

- acute hazardous waste materials
- hazardous industrial waste

- pathological wastes
- PCB wastes
- reactive wastes; and
- severely toxic wastes

as defined in Ontario Regulation 309. Similarly, pesticides as defined by the Pesticide Act, fuels and waste radioactive materials are not to be discharged to municipal sewers.

The approach potentially restricts many more chemicals than the target parameters in this study except that the chemicals are those defined strictly by Regulation 309 or the Pesticide Act.

The draft Model By-Law takes a step towards the control of toxics. Control measures arising out of the MISA initiative will more explicitly control toxics. The EMPPL is part of this developing process.

In understanding how a broader control of toxics might be regulated, it is important to know how the various toxics behave in a sewage treatment plant. A need clearly exists for further technology evaluation (such as Best Available Technology, or BAT) regarding the fate of the target compounds (Appendix 1 or 2) at municipal STPs and the ultimate goal of MISA. This will also require consideration of BAT in relation to industrial effluents discharged to the municipal sewer (pretreatment). Our interpretation of the Terms of Reference for this study is that detailed technical/ technology studies are not required. Rather the objectives and goals of sewer use controls are to emphasize the removal/ reduction of toxic pollutants (pretreatment) and also the ease of application and resulting effectiveness of the controls in attaining MISA objectives and goals. Within the MISA program, further detailed technology studies would follow as part of setting the effluent limit regulations.

The intent of the MISA White Paper is clear with respect to avoiding any individual industrial discharger being put at a competitive disadvantage. This is achieved by the uniform application of BAT effluent limits across each industrial sector in the Province and is readily applicable to direct dischargers. Presumably, water quality effluent limits will have to reflect the conditions in the local receiving body and if more stringent than BAT then effluent limits will be regulated accordingly. This may introduce an unavoidable variance in treatment levels between individual industries in a particular sector.

In relation to the municipal sector, the objective of avoiding a competitive disadvantage is applied equally. Municipalities do compete for industrial development. The MISA regulations of BAT effluent limits for municipal Sewage Treatment Plants (STPs) will be promulgated province-wide by the end of 1989 and will include limits for toxic pollutants in municipal STP effluents. As noted in the Terms of Reference for this study:

> "At that time, municipalities not complying with effluent limits may choose either to upgrade treatment facilities, implement further controls over the toxic discharges having access to the municipal sewers, or provide some combination of these abatement alternatives."

The choice by the municipality of upgrading the STP versus more control at source by industries could be problematic. For instance, if the municipality chooses to upgrade the STP and not pass the cost back to individual industries, the municipality would in effect be creating a competitive advantage in attracting new industries. Conversely, rigid

Provincial regulation of industrial effluent limits to municipal sewers may result in unnecessary on-site industrial waste treatment in relation to the capability of the municipal STP to virtually eliminate toxics from the particular industrial waste.

This simple example points out the need for this study to assess how the responsibility has been assigned in sewer use controls in other jurisdictions and the resulting degree of success or lack of success in attaining the overall goal of reducing/eliminating the access of toxic pollutants to the environment.

In addition to the potential economic impacts on industry, a particular municipal sewer use control policy may have considerable direct economic impact on a municipality. These may include the costs of upgrading and operating the STP to meet BAT effluent limits, the cost of setting up and administering the sewer use control program, the cost of monitoring for compliance and the cost of abatement and enforcement.

The direct costs to a municipality will also vary with the responsibility for the establishment and enforcement of sewer use controls, i.e. either municipal or provincial responsibility.

Similarly, the responsibilities for establishment and enforcement will also entail possible changes to legislation in Ontario. If this responsibility is assumed by the Province, the Legislative authority will be provided by the Province of Ontario and the necessary Water Resources Act and the Environmental Protection Act amendments. If the

responsibility is assumed by the municipalities, the legislative authority will be provided by the Ontario Municipal Act with the Municipality adopting a sewer use control by-law. In assessing options, the comparison will not be made solely on the legal framework required but on the effectiveness and uniformity of control attainable by either direct regulation by the Province or indirect regulation via municipalities.

1.4 Study Scope and Approach

1.4.1 Study Scope

Phase I

1. Collect data on existing sewer use controls in Canada, USA, West Germany, France, United Kingdom and Japan.

2. Prepare a long-list of sewer use control options for Ontario.

3. Undertake an initial screening of options (long-list).

Phase II

1. Carry out evaluation of sewer use control options for Ontario:

   - define affected groups
   - define evaluation methodology and criteria
   - carry out detailed evaluation of options (short-list from Phase I)
   - select preferred option(s) for Ontario.

1.4.2 Study Approach - Phase I

Identify Existing Sewer Use Control Programs for Review

The approach was designed to identify as many of the potentially useful sewer control programs that exist worldwide. The countries considered were Canada, United States, United Kingdom, Germany, France, Japan, Australia, Sweden and Holland. In Canada, particularly in Ontario, model by-laws exist which are valuable in themselves and include potentially important elements to be included in recommended options. The U.S. system has been developing since the early 70's and is approaching maturity. It is characterized by a national approach with the opportunity for considerable local autonomy. There are a variety of slightly different approaches in the U.S. that were worth considering.

In Europe, the U.K., Germany and France appear to have the more highly developed systems. They are tied together by the European Community (EC) umbrella which mandates a uniform performance of waste management systems. However, the ways in which this is accomplished varies interestingly. The U.K. has a watershed approach, the Germans a multi-tiered system geared to local needs and the French system has interesting economic variations that were deemed worth investigating. Other European countries were considered (Sweden, Holland) but had fundamentally different views on sewer use control that offered little to this study. For instance, Swedish industry tends to be located on the sea and discharge wastes directly to the marine environment where dilution minimizes the impacts (in the Swedish view).

Australia and Japan were also considered. No data has yet been obtained from Australia. The Japanese approaches are relatively new and were included for at least superficial consideration at this time.

Collection of Data on Existing Sewer Use Control Programs

The data gathering was based on a detailed questionnaire developed from an understanding of the study objectives and the knowledge of the study team on existing sewer use control systems and the regulatory framework in which they exist. In fact, two questionnaires were developed (Appendix 4), one for the regulatory or approval authority, the other for the municipal or control authority. Contacts in the various jurisdictions were made and questionnaires were mailed out after the initial contact. The individuals were asked to review the questionnaire preparatory to a second contact by project staff when detailed responses were elicited. To the extent possible, this second contact was a face-to-face interview.

The information gathered relates to legal, administrative, economic and technical aspects of sewer use controls. It includes measures of the overall effectiveness in achieving goals, the ease or difficulty of implementation and the perceptions of various levels of government, including selected municipalities, of the effectiveness and practicality of the controls.

Our approach was based on using study team members (such as WRc inc of Philadelphia and the British Water Research Centre (WRc)) who are close to and already had knowledge of conditions in the selected countries and who had established contacts.

To ensure that the information from the selected jurisdictions was consistent and suitable for assessment, standard questionnaires (Appendix 4) were used for all interviews along with standard reporting format for each jurisdiction.

This report documents the completion of Phase I.

Developing a Long-List of Control Options for Ontario

The options given in the Terms of Reference for this Sewer Use Study were identified with options reviewed in our survey of other countries and "hybrid" options were developed from the basic program characteristics identified in Section 9.

Initial Screening of Options

The long-list of options were subjected to an initial screening process using what are referred to as "exclusionary criteria". The exclusionary criteria are based on compatibility with:

- the MISA goal of "virtual elimination" of toxics;
- the Best Available Technology approach, combined with receiving water quality assessment as a more stringent requirement;
- the Ontario political framework.

1.4.3 Study Approach - Phase II

Definition of Affected Groups

The definition of affected groups is a key task because control options differ mainly in the assignment of responsibility for sewer use control, enforcement, monitoring and auditing. The affected groups include those identified in the Terms of Reference (industry, municipalities, province) and will also include the public, individual industrial sectors and levels of municipal government (local versus regional). Identification of affected groups is necesssary to isolate the distribution of effects of the options among groups, and to identify situations where costs will be passed through one group to another (e.g. from an industry to the public through product purchase price).

Definition of Evaluation Methodology and Criteria

The evaluation approach will involve an assessment of the effectiveness and cost of each option and a comparison of the options based on these two attributes. The effectiveness will be determined by comparing a given program with a set of criteria which implicitly characterize the ideal program. Chapter 10 describes the approach in more detail and introduces the initial list of effectiveness criteria.

The methodology and criteria will be "tested" on a single option (where data is available from experience with the control program) to confirm the approach and identify any data gaps.

Before the criteria are applied, they will be "weighted" to allow for comparison which can result in selection of a preferred option or options. For many of the criteria suggested in Chapter 10, subjective weighting will be required.

Selection of Preferred Option(s) for Ontario

Application of the evaluation methodology will identify a preferred option or options. These recommended options will subsequently receive further detailed assessment and public review under the MISA consultative process before implementation.

2. INDUSTRIAL DISCHARGES TO MUNICIPAL SEWERS IN ONTARIO-EXISTING CONDITIONS - AN OVERVIEW

In order to place the problem of industrial waste discharges to municipal sewers in perspective, it is necessary to generate information on the quantity and quality of those discharges. Furthermore, it is useful to identify the probable fate of the chemicals in the sewers and sewage treatment plants (sludges).

Industrial pollutants which are discharged to municipal sewage treatment plants can either:

- volatilize into the atmosphere or leak into the ground from the sewer system or

- volatilize into the atmosphere, bio-degraded in the treatment process, be removed with the sludge, or pass through to receiving waters at the sewage treatment plant.

Since comprehensive data on industrial discharges is not available for Ontario, information developed in the United States has been applied to the Ontario Industrial sectors to arrive at a definition of the magnitude of the sewer use control problem. It is noted that other studies under the MISA initiative are underway and will eventually be available to define quantities of industrial discharge more exactly.

Several hundred inorganic and organic compounds and metals have been identified in municipal wastewater effluents and sludges in Ontario[5,6,7]. Many of these contaminants when present in sufficient concentrations can adversely impact the environment and pose a health hazard. Again,

other MISA studies which are running concurrently with this sewer use study should provide more specific data on the Ontario situation.

2.1 Types of Industries and Discharges

To characterize the industries insofar as the quantity of industrial waste they discharge, a USEPA study[4] on the discharge of hazardous wastes to Publicly Owned Treatment Works (POTWs) was used as a basic data source. This study called the Domestic Sewage Study (DSS), among other things, compiled data on industrial surveys to estimate the quantity and characterize the quality of waterborne wastes generated by industries in the U.S. It further apportioned the total wastewater generation between direct and indirect (sewer) discharges. The dischargers were classified by standard industrial classification (SIC) code. The number of dischargers (indirect and total) were given and the total discharge to POTWs was estimated.

SIC codes describe the primary activity at a facility based on the principal product or group of products produced or distributed, or services rendered. An industrial categorization scheme was developed in the DSS to provide the basis for the organization of the wastewater and hazardous waste data gathered and analyzed in the DSS project.

Data from the DSS report was used in conjunction with Statistics Canada data on Ontario industry[9], Table 2-1, to develop an estimate of total discharge to municipal sewers in Ontario. The DSS discussed industry in three general categories:

- organic chemicals industries
- Consent Decree industries
- other potential dischargers of hazardous waste.

The organic chemicals industries are perceived to be major potential sources of toxic pollutants and were identified for special consideration. Consent Degree industries were classes of hazardous waste generators listed in a Consent Decree won by the National (U.S.) Resources Defense Council (NRDC) in a suit against the EPA in 1976. The discharge data for these first two types of industries are summarized in Table 3.12 of the DSS report[4] and are used in Table 2-1. The other potential discharging industries are discussed subsequently (see DSS Report Table 3.24) and are summarized in Table 2-2 below.

The data in Table 2-1 was developed by first listing the U.S. industrial classifications used in the DSS report. The Canadian equivalent industrial classifications were determined and the standard descriptions listed along with the Canadian Standard Industrial Classification Code (Stats Canada). From this listing of Canadian industries the number of Ontario establishments was obtained from the 1984 Statistics Canada reviews[9] of each of the industry groups. From the U.S. data the ratio of establishments discharging indirectly (i.e. to POTWs) to the total number of establishments was calculated and used to estimate the number of Ontario establishments discharging to municipal sewers. Also from the U.S. data the average discharge rate to POTW by establishments discharging to sewer was calculated and this average discharge rate was used to estimate the discharge flow to Ontario's municipal sewers. Finally, the DSS ratio of "zero dischargers" to total dischargers was developed from Table 3.12 data and it was used to estimate the number of industries in Ontario that were zero dischargers to municipal sewers.

TABLE 2-1

LIST OF INDUSTRIAL CATEGORIES AND ESTIMATED WASTEWATER DISCHARGES TO SEWERS

RCRA-DSS Class	Canadian Equivalent	Cdn. SIC	No. Estab.	DSS Ratio Indir/Total	DSS Indir. Flow (x 1,000 USG/ Estab.)	Est. No. Ontario Estab. Indirect	Est. Ontario Flow MIGD	DSS Ratio Zero Discharge to Total	Estimated No. Ontario Zero Discharge
. Adhesives & Sealants	Adhesive Industry	3792	21	0.59	9.1	12	.095	.39	8
. Battery Manufacture	Battery Industry	3391	14	0.59	53	8	.36	.33	5
. Coal, Oil and Petroleum Products, and Refining	Refined Petroleum Prod.	3611	9						
	Lubricating Oil & Grease	3612	14						
	Other Petroleum/Coal (e.g. asphalt)	3699	20						
			43	0.26	2050	11	19.	.12	5
. Dye Manufacture and Formulating	No Manufacture	-	-	0.81	240	-	-	-	-
								.06	8
. Electric and Electronic Component	Electronic Parts and Components	3352	125	0.71	124	89	9.3		
. Electroplating and Metal Finishing	Custom Coating of Metal Products	3041	160						
	Jewellry & Silverware	3921	178						
			338	0.78	54	264	12	.0	0
. Equipment Manufacture and Assembly	Agricultural Imple.	3111	76						
	Commercial Refrigeration and A/C	3121	33						
	Compressor and Pump and Industrial Fan	3191	55						
	Construction & Mining	3192	189						
	Machinery and Matl. Handling Equipment	3199	432						
	Commercial Trailer	3342	22						
	Non-Commercial Trailer	3243	23						
	Mobile Home	3244	2						
	Motor Vehicle Parts Engine - Fabric	3251 to 3259	352						
	Railroad Rolling Stock	3261	11						
	Ship Building & Repair	3271	9						
	Boat Building & Repair	3281	104						
	Other Motor Vehicle	3299	5						
			1433	N/A	N/A	N/A	N/A		
	Non-Ferrous Metal Forming Data*			.31	.160	444	60	.51	731
8. Explosive Manufacture	Other Chemical Products See No. 17 below	3799	-	.02	<250	-	-	.83	0
9. Gum & Wood Chemicals and Related Oils	Other Chemical Products see No. 17 below	3799	-	.08	300	-	-	.83	0
0. Industrial & Commercial Laundries	Power Laundries/Dry Cleaning Linen Supply	9721)) 9725)	No Data						
		MOE Data**	1924	.997	7.7	1920	14.7	.0	0
1. Ink Manufacture and Formulation	Printing Ink Industry	3791	30	.48	<4	14	<.004	.0	0

* DSS Class 15, Non-Ferrous Metal Forming Data used in absence of data for DSS Class 7.

** Telephone discussion, Keith Madill, 87.06.11. Dry cleaning establishments account for 1316 of 1924 total cleaning establishments.

TABLE 2-1

LIST OF INDUSTRIAL CATEGORIES AND ESTIMATED WASTEWATER DISCHARGES TO SEWERS

(continued)

RCRA-OSS Class	Canadian Equivalent	Cdn. SIC	No. Estab.	OSS Ratio Indir/Total	OSS Indir. Flow (x 1,000 USG/ Estab.)	Est. No. Ontario Estab. Indirect	Est. Ontario Flow MIGD	OSS Ratio Zero Discharge to Total	Estimated No. Ontario Zero Discharge
2. Inorganic Chemical Formulation	Inorganic Chemicals	3711	35						
	Agricultural Chemicals	3712	3						
	Mixed Fertilizer	3722	44						
			82	.16	600	13	6.5	.08	6
3. Iron & Steel Manufacturing and Forming	Ferro-Alloys, Steel Foundries Primary Steel and	2911 to 2919	25						
	Steel Pipe & Tube	2921	18						
	Iron Foundries	2941	56						
	Iron & Steel Production		Sub Total 99**	.16	2660	16	36**	.12	12
	Power Boiler & Exchanger	3011							
	Heavy Plate-Structural to Structural	3021 to 3029	159						
	Door/Window to Architectural	3031 to 3039	303						
	Metal Closure, Container and Stamped Products	3042 to 3049	332						
	Wire Products	3051 to 3059	188						
	Hardware/Cutlery	3061 to 3069	641						
	Heating Equipment	3071	77						
	Machine Shops	3081	642						
	Metal Plumbing & Fixt.	3091	22						
	Metal Valves	3092	24						
	Other Metal Fab.	3099	256						
			2767* Sub Total	.16	2660	443	983*		
	Non Ferrous Metal Forming Data		2668**	.31	160	827	111	.12	320
4. Leather Tanning and Finishing	Leather Tanneries	1711	15						
	Footwear	1712	86						
	Luggage, Purse, etc.	1713	29						
	Other Leather	1719	31						
			161	.88	45	142	5.3	.01	2
5. Non-Ferrous Metal Forming	Al Rolling, Casting, etc.	2961	27						
	Cu Rolling, Casting, etc.	2971	29						
	Other Rolling, Casting, etc.	2999	51						
			117	.31	160	36	4.8	.51	60
6. Non-Ferrous Smelting	Non-ferrous Smelting and Refining	2950	11	.27	N/A	3	N/A***	.48	5
17. Organic Chemical Manufacturing	Organic Chemical	3712	24						
	Other Chemical Products	3799	161						
			185	.43	286	80	18.9	.26	48
18. Paint Manufacture and Formulation	Paint and Varnish Ind.	3751	82	.50	1	41	.04	.50	41

* Data recorded but not used because of inconsistency. See text.
** Data used. See text.
*** Ontario establishments all believed to be direct dischargers.

TABLE 2-1

LIST OF INDUSTRIAL CATEGORIES AND ESTIMATED WASTEWATER DISCHARGES TO SEWERS

(continued)

RCRA-OSS Class	Canadian Equivalent	Cdn. SIC	No. Estab.	DSS Ratio Indir/Total	DSS Indir. Flow (x 1,000 USG/ Estab.)	Est. No. Ontario Estab. Indirect	Est. Ontario Flow MIGD	DSS Ratio Zero Discharge to Total	Estimated No. Ontario Zero Discharge
9. Pesticide Formulation	Other Agric. Chem.	3729	5	.13	23	1	.02	.87	4
0. Pesticide Manufacture	See #19								
1. Pharmaceutical Manuf.	Pharmaceutical and Medicinal Industry	3741	68	0.60	172	41	5.9	.29	20
2. Photo Chemicals and Film Manuf.	Other Industrial and Related Products	3912	75	N/A Total = 142	N/A	-	-*	.21	16
3. Plastic Molding and Forming	Foamed and Expanded Plas.	1611	34						
	Plastic Pipe & Fittings	1621	36						
	Plastic Film and Sheet	1631	25						
	Plastic Bag	1691	40						
	Other Products	1699	372						
			507	0.44	16.1	224	3.0	.24	122
4. Plastic Resins and Synthetic Fibre Manufacture	Plastic and Synthetic Resin	3731	42	0.40	138	17	1.97	.29	12
5. Porcelain Enameling	Clay Products Ind.	3512	29	.76	64	22	1.2	.0	0
5. Printing and Publishing	Business Forms	2811	71						
	Other Commercial	2819	1221						
	Plate Making, Typesetting	2821	424						
	Book Publishing	2831	79						
	Other Publishing	2839	316						
	Newspapers, Mags, Periodicals	2841	192						
	Other Combined	2849	17						
			2320	.69	1.2	1590	1.6	.3	719
7. Pulp and Paper	Pulp Industry	2711	5						
	Newsprint Industry	2712	9						
	Paperboard Ind.	2713	11						
	Bldg. Board Ind.	2714	5						
	Other Paper	2719	9						
			39	.39	2240	15	28.0	.08	3
8. Rubber Manuf. and Processing	Other Rubber Prod. Ind.	1511) 1519)	66						
	Rubber Hose and Belting	1521	13						
			79	.33	250	26	5.4	.0	0
9. Textile Mills	Man-Made Fibre & Yarn	1811	17						
	Wool Yarn & Woven Cloth	1821	9						
	Other Spun Yarn	1829	33						
	Broad Knitted Fabrics	1831	19						
	Nat. Fibre Processing	1911	16						
	Carpet, Mat, Rug	1921	18						
	Canvas and Related	1931	76						
	Narrow Fabric Through Other	1991 to 1999	247						
			435	.40	348	174	50	.12	52
0. Timber Products	Sawmill, Planing Mill	2512	225						
	Veneer, Plywood	2521) 2522)	24						
	Prefab. Cabinets, Millwork	2541 to 2549	381						
	Wooden Box, Pallet	2561	96						
	Coffin and Casket	2581	6						
	Wood Presser	2591							
	Particle Board	2592							
	Wafer Board	2593							
	Other Wood Prod.	2599	106						
			838	0.50	N/A	419	N/A**	.47	394
	GRAND TOTAL		11,897 Industries			6,449 Industries	395 MGD		2,603 Industries

* Metal recovery practical.
** Primarily direct dischargers in Ontario.

TABLE 2-2

OTHER INDUSTRIES POTENTIALLY DISCHARGING HAZARDOUS WASTE

RCRA - DSS Listing	Estimate Ontario Site	Comment
Construction Industry	N/A	N/A
Cosmetic, Fragrances Flavours and Food Additives	49	SIC 3771, Stats Can 1984, Toilet Preparations
Electrical Generating Power Plants and Electrical Distribution Services	350	Approximately 325 local utilities, some with multiple plants, ca 75 serve populations >10,000. Ontario Hydro generating plants are direct dischargers
Fertilizer Manufacture	-	Covered in Inorganic Chemicals
Food and Food By-Product Processing	2500	Scott's Directory lists establishment as follows: 325 Meat processing, 275 Dairy Products, 500 bakeries, 200 beverage, 300 canned frozen, 100 Confectionary, 300 Miscellaneous, 400 Cereal, 50 Oils.
Hazardous Waste Site Clean-up	-	Not discharged to municipal STPs.
Laboratories and Hospitals	400	MOE Lab Capability Study. 160 industrial, 50 additional non-industrial, 50 governmental, 140 hospitals
Miscellaneous Chemical Formulations	-	Assume captured by 3700 series SIC
Motor Vehicle Services	2000	MOE Survey*

* Telephone conversation, Allister Stewart, MOE, 87.06.11.

TABLE 2-2

OTHER INDUSTRIES POTENTIALLY DISCHARGING HAZARDOUS WASTE

(continued)

RCRA - DSS Listing	Estimate Ontario Site	Comment
Service Related Industry	N/A	N/A
Soaps, Detergents, Cleaning Preparations, and waxes	67	SIC 3761, Stats Can 1984, Soaps and Cleaning Compounds
Stone, Clay, Glass, Concrete and other Mineral Products	7000	Scott's Directory: 30 Glass, 100 Clay, 400 concrete, 50 abrasive, 80 gasket, 50 miscellaneous.
Transportation Services	N/A	Included in motor vehicle services.
Waste Reclamation Services	50	Directory of Hazardous Waste Services, Corpus Information Services 1985
Waste Treatment and Disposal Facilities	10	
Wholesale and Retail Trade	N/A	N/A
Wood Furniture Manufacture and Refinishing	N/A	N/A
TOTAL	12,426	

N/A = not available to this study.

Some discrepancies and data mismatches occurred in the original match-up of the U.S. and Canadian situations. First, the U.S. data was not available for the equipment manufacture and assembly industrial category. The only other category that would expect to discharge on a similar basis for which there was data was the non-ferrous metal forming category. The ratio of indirect dischargers to total establishments for this latter category was used. Similarly, the indirect flow rate per establishment was adopted from the non-ferrous metal forming category.

In the iron and steel manufacturing and forming category, there were too many industries indicated to be realistic in any Ontario-U.S. comparison. However, by dividing the category into iron/steel production and steel fabrication categories, Canadian two digit SIC's 29 and 30 respectively, more realistic discharge data are produced.

The DSS listed another 17 industries as those potentially discharging hazardous waste to POTWs. These are listed in Table 2-2 together with estimates for the number of sites by industrial category and a commentary on the basis for making each assessment. Some data gaps exist in this survey. Of these industries the motor vehicle service industry and the food processing industry are the most significant.

The total estimated flow of process wastewaters from Table 2-1 industries to municipal sewers is 395 million gallons per day. This is about 40% of the total sewage flow in Ontario (see Section 2.2 for total sewage flow data). The major contributors are the iron and steel forming industry, the pulp and paper industry and the textile industry. The number of industrial establishments listed by Statistics Canada in these categories (Table 2-1) amounts to some 11,900 industries. Of these industries, this estimate suggests that about 6,450 industries in these classifications discharged

indirectly (i.e. to municipal sewers). This compares with the 12,000 industries referred to by MISA[1] as being dischargers to municipal sewers. The difference in these data will be accounted for, in part, by the indirect dischargers among the industries listed in Table 2-2.

For comparison purposes, the DSS report states that an estimated 2,700 million gallons per day of process wastewater is discharged by approximately 160,000 US industrial and commercial facilities into POTW's, constituting approximately 12% of total POTW flow.

The estimates made in Table 2-1 can be used to suggest that there should be almost 2,850 direct dischargers to surface water in Ontario (i.e. 6,449 indirect dischargers, 2,603 zero dischargers out of 11,897 industries leaves 2,845 direct dischargers). This disagrees with the estimate of 300 direct dischargers in Ontario that was published in the MISA White Paper[1]. This discrepancy is noted; possible explanations involve:

- different practice in the U.S. involving many more direct dischargers of small quantities of waste;

- a different accounting process for total numbers of direct dischargers in the DSS and the MISA White Paper wherein the MISA estimate did not include a lot of small quantity direct dischargers.

In a joint report completed for Environment Canada and others[10] the industrial component of municipal sewer flow was estimated by a survey technique. The data for Ontario municipalities participating in that survey is given in Table 2-3. It suggests that about 20% of the municipal sewage flow originates from industry.

TABLE 2-3

TOTAL FLOW AND INDUSTRIAL COMPONENT FOR SELECTED ONTARIO MUNICIPALITIES

Municipality	Total Flow $m^3/d \times 10^3$	Industrial Flow $m^3/d \times 10^3$
Barrie	21.8	6.7
Durham	149.6	18.4
Guelph	43.2	7.7
Halton	137.7	9.1
London	190.0	13.1
Niagara	204.4	49.2
Orangeville	8.0	0.8
Peterborough	45.5	8.9
Stratford	13.6	2.0
Waterloo	150.2	62.2
Windsor	146.4	39.3
	1110.0	217.0
		or 19.6% of Total

This estimate is about half of the estimate based on number of establishments and average discharge rate per United States establishment, as discussed above. The Environment Canada estimate[10] is based on a survey in Canada and may be more accurate, particularly considering the source of the major contributors to the total sewage flow calculated from the U.S. experience. Steel and pulp and paper industries, for example, tend to be exclusively direct dischargers to surface water in Canada. In the U.S. the population pressure means there are fewer opportunities to locate in remote areas and use of municipal sewers is likely more practical.

2.2 Municipal Sewage Treatment in Ontario

To characterize the municipal sewage treatment practice in Ontario, two published data sources were used. The Ministry of the Environment regularly collects and publishes data on the discharges from municipal wastewater treatment facilities in Ontario[11] including data on population served, average daily flow, influent/effluent data for BOD, suspended solids and total phosphorus, treatment type and receiving watercourse. This data has been summarized for previous years in a report[12] on a strategy for monitoring hazardous components in sewage plant effluents and sludges. Data summaries have been adapted from these reports.

The total number of treatment plants in Ontario is 379 (1985 data). These are broken down into general type and flow ranges as shown in Table 2-4. Another breakdown by treatment type and total treatment in Ontario is given in Table 2-5. Sewage flow amounts to more than 4.6×10^6 m^3/d or more than 1.0×10^3 MGD. These data show that most sewage receives secondary treatment in the form of conventional,

TABLE 2-4

NUMBER OF MUNICIPAL SEWAGE TREATMENT PLANTS IN ONTARIO (BY TYPE AND FLOW RANGE)

	NUMBER IN AVG. DAILY FLOW RANGE				TOTAL
	<4,540 m^3/d	4,540 - 22,700 m^3/d	22,700 - 45,400 m^3/d	>45,400 m^3/d	
Lagoons	134	5	-	-	139
Primary	19	13	1	9	42
Activated Sludge	26	35	16	12	89
Extended Aeration	103	6	0	0	109
TOTAL	282	59	17	21	379

TABLE 2-5

MUNICIPAL SEWAGE TREATMENT PLANTS IN ONTARIO (BY TREATMENT TYPE AND TOTAL AVERAGE DAILY FLOWS)

Treatment Type	No. of Plants	Total Average Daily Flow $m^3/day \times 10^3$
Aerated Lagoons	17	37.85
Annual Lagoons	20	28.79
Communal Septic Tanks	5	2.28
Exfiltration Lagoons	5	6.67
Contact Stabilization	12	48.92
Conventional Activated Sludge	87	3249.30
Extended Aeration	86	102.40
High Rate Act. Sludge	5	75.92
Lagoon/Spray	3	1.41
Oxidation Ditches	11	12.28
Seasonal Lagoons	94	82.76
Primary Treatment	32	992.89
	379	4641.47
		$\times 10^3$ m^3/day
		or 1,023 MGD

extended or high rate activated sludge treatment. A significant proportion of the total flow still only receives primary treatment and there are a large number of small systems using one variation or another of a lagoon treatment.

Assuming a biological treatment system, EPA estimates that between 82 and 92% of all pollutants are removed by POTW's from discharges to surface water[4]. Ongoing studies in Ontario and in the United States are attempting to develop more specific data relating to particular waste constituents and their fate in POTW's.

2.3 Sewage Sludge Management in Ontario

In understanding the potential fate of toxics in sewage plant influents, it is important to understand the way in which sludge is managed in Ontario. Sewage sludge generated by sewage treatment plants is managed generally by land application or incineration. The distribution of management technique by plant size is given in Table 2-6[12].

The land application techniques are split between direct landfilling as an ultimate disposal method and the use of sludge as a soil amendment agent in an agricultural setting.

Among the "other" methods of disposal, incineration, mine tailings amendment and drying lagoons are used (see Table 2-7). It is important to note that incineration is the ultimate disposal method for plants treating over 30% of the total sewage flow in Ontario[12]. This method is used in six major plants from Pickering through to Hamilton and London.

TABLE 2-6
SLUDGE DISPOSAL METHODS

Sludge Disposal Method	Number of Plants in Average Daily Flow Range <4,540 m^3/d	>4,540 m^3/d	Total
Agricultural Use	74	52	126
Landfill	15	26	41
Other	54	14	68
			235

TABLE 2-7
SLUDGE DISPOSAL BY "OTHER" TECHNIQUES FOR PLANTS WITH >4540 m^3/d FLOW

Method	Number of Plants	Total Flow x 10^3 m^3/d
Incineration	5	1,500
Mine Tailings	3	68
Drying Lagoon/Bed	5	245
Unknown	1	7
	14	

3. MUNICIPAL SEWER USE CONTROL IN CANADA

3.1 Jurisdictional Authority over Water in Canada

The Canadian Constitution divides authority over various matters between the federal and provincial governments. In general terms, jurisdiction over "water" falls to the provinces(13). Having said that, it is important to note that the constitution does not deal with water explicitly; rather, it deals with water uses such as fishing, navigation and electricity generation. Such uses fall under the jurisdiction of the provinces because the constitution assigns the provinces legislative authority over "property and civil rights", "...matters of a ... local or private nature" and "local works and undertakings". In regard to provincial proprietary jurisdiction, the provinces are taken to own all the "public lands" within their boundaries. The concept of "public land" has been held to include water. The provisions in total reinforce the notion of provincial authority over water.

3.2 Federal Legislation Governing Use and Quality of Water

A number of federal acts address matters pertaining to water and water quality, under specific legislative and proprietary powers enumerated in the Canadian Constitution. Included are the Fisheries Act, the Environmental Contaminants Act, the Canada Shipping Act, the Atomic Energy Control Act, the Navigable Waters Protection Act, the International Boundary Waters Treaty Act and the Canada Water Act. While a few other Acts and Conventions exist, these are the ones that affect this study.

The principal federal water pollution control statute is the Fisheries Act. It prohibits the disturbance of fish habitat and makes it an offence to discharge a "deleterious substance" into "water frequented by fish". This Act has been the most widely used federal instrument for water quality control. Under its provisions, several major industrial groups are regulated. Uniform effluent standards throughout Canada for these industries are applied as minimum requirements.

The Environmental Contaminants Act (ECA) establishes a list of substances likely to enter the environment in sufficient quantity or concentration to constitute a significant danger. The onus is on the government to demonstrate that the substance causes a danger, which restricts the application of the ECA. (A draft Canadian Environmental Protection Act will likely replace this Act, along with other legislation, in late 1987 or early 1988.) Only a very few chemicals, such as PCBs and mirex, have been listed which are of relevance to water quality.

The Canada Shipping Act has only general provisions relating to pollution from ships in southern waters (the Arctic Waters Pollution Prevention Act is the northern equivalent). The Atomic Energy Control Act is relevant to radionuclides and the Navigable Waters Protection Act controls structures or dumping that impedes navigation. The International Boundary Waters Treaty Act is a valuable instrument which is now tied to the International Joint Commission, which we discuss below.

The Canada Waters Act has the potential to be very useful, but has not been developed by successive federal administrations since its passage in 1970. One part empowers the federal government to enter into agreements with the

provinces to study and plan for regional water quality management. The second part prohibits the discharge of waste into such water quality management areas. No such areas have been created, and the Act has had little use since passage of the law. Its only direct impact has been to control phosphorous discharge into transboundary waters by regulation.

The International Joint Commission (IJC) a body established under the International Boundary Water Treaty Act has been a significant force in water quality issues in Ontario. In response to concern over the eutrophication of some of the Great Lakes, Canada and the United States, through the IJC, entered into the Great Lakes Water Quality Agreement of 1972. The Agreement set objectives for water quality, addressed phosphorous loadings and specified remedial programs. In 1978, the Agreement was expanded to:

- set standards for water quality for industrial pollutants and toxic substances;

- commit the countries to virtual elimination of persistent toxic substances; and

- commit the countries to a more stringent control of phosphorus loadings.

Included in the Agreement was a commitment to develop and implement programs for the pretreatment of industrial waste discharged directly or indirectly into Great Lakes waters.

3.3 Provincial Legislation Governing Use and Quality of Water

In Ontario, the use and quality of water is regulated under two principal Acts, viz:

- The Ontario Water Resources Act (OWRA);
- the Environmental Protection Act (EPA).

The OWRA regulates or prohibits discharges to water. The Act is also the primary legislation for financing of municipal sewage treatment and water supply facilities.

The EPA is broader legislation which regulates or prohibits the discharge of contaminants into the natural environment, and therefore overlaps the OWRA in its application to water. It also is the primary legislation dealing with waste management issues. Recently, Ontario has required registration (under Regulation 309 of the EPA) of waste generation activities including industrial discharges of hazardous waste to municipal sewers and direct discharge of treated industrial wastes.

The OWRA prohibits the discharge or deposit of any material into any well, lake, river, pond, spring, stream, reservoir, etc. or on any shore, bank or in any place that may impair the quality of water, i.e. cause or may cause injury to any person, animal, bird or other living thing. The OWRA also requires certificates of approval or provisional certificates of approval for the construction and operation of water and sewage works. Permits to take water from a water body are also required.

The OWRA states:

> "Subject to the approval of the Lieutenant Governor in Council, the Minister may make regulations ... regulating and controlling the content of sewage entering sewage works."

While this permits the Province to regulate industrial discharges to municipal sanitary sewers, this responsibility has been exclusively delegated to the municipalities and regional governments in Ontario.

Air emissions, landfilling activities and waste treatment facilities in general are subject to approval under the EPA. For major industry sectors that have large impacts on receiving waters, e.g. mining, pulp and paper, sewage works, effluent regulations have been established. Specific regulations for the designation and handling of special wastes (e.g. PCBs) and waste management are also created by the EPA.

The provincial power over water is limited by specific but limited federal powers such as:

- Federal power over the fishery, although this is limited to the regulation and protection of the fishery itself, not the fish, which are "property" and thus under provincial control.

- Federal power over navigable waters, which includes the construction of works for the improvement of navigation.

- Federal power over federal lands, including northern territories, national parks and native reserves.

- Residual powers governing "works" for the "general advantage of Canada" and "peace order and good government".

Another important area where provincial power is not absolute is the authority over interjurisdictional waters. In Canada,

where a number of significant watercourses flow from one province to another or form the international boundary, this authority becomes significant. At present, the approach is to have both federal and provincial authority in effect for these interjurisdictional waters. This is known as "layering" the authority which requires the two levels of government to cooperate in these areas.

The federal government has developed guidelines to indicate the degree of treatment and effluent quality that is applicable to all wastewater discharged from Federal installa tions. Where such wastewaters discharge to municipal sewers, pretreatment may be required where the effluent may cause fire on explosion or be injurious in any way to a collection or treatment or cause violation of effluent or receiving water standards.

The stated goals for surface water quality management in Ontario are contained in a Ministry of the Environment document entitled "Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment - May 1984" (The "Blue Book").

The disposal of sludge produced at sewage treatment plants is important to the overall environmental management of wastewater discharges. Sludge generated by municipal sewage treatment works is disposed of by four major means:

- at the sewage treatment plant site in drying beds or lagoons;
- dewatered and disposed of at an approved sanitary landfill site;
- conditioned and spread on agricultural land;
- incinerated.

Disposal at the sewage treatment plant site (incineration, lagoons or drying beds), is regulated under the EPA and is now subject to a class environmental assessment under the Environmental Assessment Act. Guidelines are under development for the design and operation of incinerators.

Disposal at a landfill site is also regulated under the EPA and disposal guidelines are under development to minimize the release of toxics and other contaminants to the environment.

Guidelines for sewage sludge disposal to agricultural land are contained in the Ontario Ministry of the Environment publication "Guidelines for Sewage Sludge Utilization on Agricultural Lands". These guidelines set allowable limits for the concentrations of 11 heavy metals in sludges applied to soil. The guidelines also specify the operating conditions for the spreading of sludge and the physical site characteristics needed to minimize pollutant runoff and ground water contamination.

In keeping with the public demand for more severe penalties for polluters, amendments were made to the EPA and the OWRA in late 1986. As stated in Ref. 14:

> "There are now some 16 different levels of penalty under both Acts. The basic fines for a non-polluting offence are a maximum $5,000 for a first offence by an individual and $10,000 for each subsequent offence by an individual and a maximum of $25,000 for each subsequent offence by a Corporation. For pollution offences, an individual can be sentenced to up to one year imprisonment and a corporation is subject, on first offence, to a minimum fine of $2,000 and a maximum fine of $50,000 and on subsequent offences to a minimum fine of $4,000 and a maximum fine of $100,000. For offences related to liquid industrial or hazardous waste, an individual can face fines of up to $10,000 for a first offence and $25,000 for subsequent offences and a corporation can face fines of $250,000 for a first offence and $500,000 for subsequent offences".

3.4 Jurisdiction Over Industrial Wastewater Discharges to Municipal Sewers

a) Ontario

Industrial wastewater discharges to municipal sewers are controlled and regulated by municipal by-laws made under the Municipal Act or the appropriate Regional Municipality Acts. The Municipal Act, RSO, 1980, Chapter 302, S 210, para. 147 (as amended) states:

> "By-laws may be passed by the Councils of local municipalities ... For prohibiting, regulating and inspecting the discharge of any gaseous, liquid or solid matter into land drainage works, private branch drains and connections to any sewer, sewer system or sewage works for the carrying away of domestic sewage or industrial wastes or both, whether connected to a treatment works or not".

The implied objectives of the existing by-laws are:

- Protection of municipally-owned capital works by limits on pH and temperature, explosive matter, gasoline, etc.

- Ensuring proper operation of the sewage treatment facilities by imposing limits on toxic material, oil and grease, BOD and suspended solids.

- Prevention of nuisance or unsafe conditions by prohibiting sewage that may cause offensive odours, explosive matter, gasoline, etc.

- Ensuring that sewage plant effluent requirements can be met by limiting toxic matter, BOD, suspended solids and in some cases, phosphorus and ammonia nitrogen.

Municipal by-laws regulating discharges to municipal sewers are based on a model by-law prepared by a joint committee of the Ministry of the Environment and the Municipal Engineers Association. The number of parameters, their limits and use of special agreements (usually with a surcharge) for regulated parameters vary to suit the needs and monitoring capabilities of the individual municipality.

A draft model by-law to "Control Waste Discharges to Municipal Sewers" dated April 22, 1987 (Appendix 3) is currently being considered and was originally intended to supplant a previous model by-law. The list of prohibited matter includes pesticides as defined by the Pesticides Act and hazardous and toxic chemicals as defined by Ontario Regulation 309. Identification and quantification of these chemicals is beyond the capability of most municipal laboratories in Ontario.

The effectiveness of the Municipal by-laws in controlling industrial discharges to the municipal sewers depends on the vigour with which the by-laws are enforced. Successful enforcement is a measure of the municipality's will to control industrial discharges and the enforcement staff's skill in negotiating satisfactory solutions. Enforcement of the by-law varies widely. Comprehensive monitoring and plant inspection programs are actively administered in Metro Toronto and Regional Municipality of Waterloo. Many smaller municipalities (with populations less than 2,000) do not have sewer use by-laws.

Prosecutions tend to be "last-resort" actions. Maximum fines permitted under the Municipal Act are $2,000. The cost of preparation of the case generally far exceeds the fine, and the fine imposed by the courts is often only a fraction of the maximum allowed.

b) Remainder of Canada

As in Ontario, industrial discharges to municipal sewers are controlled and regulated by municipal by-laws made under the Provincial Municipal Acts.

Only the Province of Quebec has a model by-law which the Ministere de l'Environnement is encouraging municipalities to adopt. The sampling of municipal by-laws across Canada shows a striking resemblance to by-laws in Ontario.

Provincial jurisdiction, as in Ontario, begins with discharge to the natural environment.

i) British Columbia

The Greater Vancouver Regional District (GVRD) was taken as an example of municipal sewer use control on the advice of B.C. Government staff.

GVRD is currently conducting a source control program so that its sewage treatment plants can meet Provincial effluent requirements for heavy metals. The first phase of the program is characterization of the metal plating industry wastewaters. The industry has been ordered to monitor its discharges.

GVRD does not have an enforceable sewer-use by-law. A regulation for controlling discharges to the regional districts sewers was drafted in 1971 but never passed by Council. The draft regulation has been used as a guideline for negotiations with industry.

GVRD sewage treatment plants, particularly those discharging into the Fraser River cannot meet Provincial effluent requirements for metals despite attempts to persuade the metal plating industry to reduce discharges.

ii) Alberta

The Cities of Calgary and Edmonton have Municipal Sewer Use by-laws with widely different maximum fines. The maximum fine in Calgary is $2,500 with a minimum fine for the second offence of $300. The maximum fine in Edmonton is $200. Both cities report that while the by-laws are effective in controlling industrial discharges, it is through negotiations and control orders that the system works. Prosecutions have proven to be ineffective.

The City of Edmonton is instituting a new procedure to streamline prosecution: on detection of a violation of the by-law, a ticket, much like a parking ticket, is issued. The procedure is untested.

iii) Saskatchewan

Compliance orders are used to control industrial discharges. There have been no prosecutions for infractions under the City of Regina's municipal by-law.

City staff feel the by-law is too rigid. It does not permit agreements with larger industries to develop discharge criteria on a case by case basis.

iv) Manitoba

Winnipeg is an unusual case in that the City has been delegated the responsibility for controlling effluent discharges to

watercourses in the Winnipeg area. The delegation of authority is under the provincial Clean Environment Act S 17(1) which states:

> "The Lieutenant Governor in Council may delegate such part of the powers of the commission as he deems advisable to the City of Winnipeg for such period of time and subject to such conditions as he may deem fit".

The sewer use by-law made under the Municipal Act contains the fewest specific parameters of all the municipalities surveyed in Canada.

v) Quebec

The Montreal Urban Community's (MUC) Reglement No. 87 controlling industrial discharges to the municipal sewers is based on the Ministere de L'Environnement model sewer use by-law.

The MUC Regulation was promulgated in June 1986 and is still in the implementation stage.

vi) New Brunswick

The City of Fredericton has a sewer use by-law (By-law No. 857) in place. The Fredericton By-Law has special limits for 24 parameters. Only three are enforced, BOD, suspended solids and oil and grease.

vii) Nova Scotia

There are no sewer use by-laws in force in the Province. However, the Province has a "Proposed Model Municipal By-Law Governing the Discharge of Waters and Wastes into the Public Sewers" dated (Revised) 13/3/87. The model by-law has specific limits for 20 parameters but does not include BOD.

While not a sewer use by-law or regulation, there is an agreement between Kings County (owner of a sewage transmission main and sewage treatment plant) and the Village of New Minas regulating discharges to the system by the Village. The agreement contains specific limits for 16 parameters including flow and mass discharges of BOD and suspended solids.

viii) Prince Edward Island

The City of Charlottetown has a public utilities regulation covering sewer use. In Section 3.24, "Prohibited Sewage", eight parameters with specific limits are listed. No fines are provided for by-law infractions. However, suspension of water service is used to enforce the by-law.

ix) Newfoundland

There are no sewer use control programs available in the Province for evaluation.

3.5 Effectiveness of the Sewer Use By-Law Approach

While each municipality differs in the specifics of By-Law application, the experience in the Regional Municipality of Waterloo, Ontario, provides an example of what can be achieved with a well run program.

The Regional Municipality has developed a regular sampling program for all industries discharging to the municipal sewer system. The type of analyses and the frequency of sampling is tailored to the individual industry depending on waste quantity and type (general waste, toxic waste or surchargeable waste). A surcharge is applied to certain waste categories which can be accepted and treated at the Region's sewage treatment plants.

Compliance with the By-Law has been good and is generally based on cooperation rather than on legal action by the Region. Internal protocols and legal sampling procedures have been developed by the Region to substantiate legal action.

The most striking example of the effect of the by-law has been in the reduction of heavy metals in industrial wastes. At least two of the Region's sewage treatment plants were found to have metal content in sludges which were above the level specified by the Ministry of the Environment for sludge disposal by application on agricultural land. Industries discharging the specific metals were identified and through the By-law convinced in one case to cease dumping of the contaminated waste stream and in another case to install pretreatment facilities. Sludge characteristics were modified to the extent that land application was viable. Other options for sludge disposal (other than to agricultural land) would have been considerably more expensive for the Region.

The <u>City of London</u>, Ontario has also used its sewer use by-law to reduce industrial waste discharges. Wastes containing heavy metals were interfering with the biological treatment process at the municipality's Vauxhall Pollution

Control Plant. The plating companies responsible for these discharges were identified and over a period of years have reduced their waste levels to the point where the municipal plant can produce a high quality effluent without upset due to shock loadings.

There are many other instances throughout Canada where a municipal sewer use by-law has been used to reduce industrial waste discharges to municipal sewers.

Until recently, these by-laws did not deal with toxic wastes (except for heavy metals) in any comprehensive manner. As mentioned previously, the goals of the by-law were to prevent damage or blockage in the sewers and avoid upsetting the sewage treatment plant processes or injuring municipal workers.

Many municipalities include clauses in their by-laws which allow industries to exceed by-law limits by paying a surcharge for the additional waste, based on a calculation of the cost to the municipality for treating the waste. The draft Ontario model by-law (Appendix 3) allows for such a surcharge.

The effectiveness of municipal sewer use by-laws for control of toxic industrial wastes will depend on the limits which are set in the by-law and the vigour with which the municipality imposes its laws. Currently there are several factors which mitigate against effective control leading to virtual elimination of toxics. These include:

- political pressure to balance the environmental benefits against possible loss of jobs;

- adequate resources to monitor and enforce;

- the treatment capacity available at the municipal plant which can be used to accept and treat toxic wastes without plant upset;

- competition between municipalities to attract new industry.

Municipal by-laws can be most effective where it is clearly in the best interests of the municipality to achieve virtual elimination of toxic contaminants. The "best interests" of the municipality was defined above in the Region of Waterloo as a lowest cost sludge disposal option and in the City of London as a treatment plant that was not subject to major upset by heavy metal toxicity. To virtually eliminate toxic contaminants will probably only become a "best-interest" under considerable legal or financial pressure from the Province based on failure to meet effluent requirements from the municipal treatment plant.

3.6 Contacts Made in Canada

The control of sewer use in Canada is most advanced in Ontario. However, to document the precise situations in the rest of Canada, contacts were made with wastewater departments in major cities and with provincial environment ministries. In Ontario a more extensive set of contacts were made covering a variety of municipalities, in order to explore the existing situation throughout the Province. The following is a list of contacts made:

British Columbia:	Mr. Ross Schwaikosky Pollution Control Greater Vancouver Regional District (604) 432-6432
Alberta:	Mr. Ken Elstone Superintendent Wastewater Treatment City of Edmonton 3rd Floor, West Chambers 12220 Stony Plain Road Edmonton, Alberta T5N 3Y4
	Mr. Wally Meckleborg Waste Treatment Engineer Bonnybrook Wastewater Treatment Plant City of Calgary P.O. Box 2100 Calgary, Alberta T2P 2H5
Saskatchewan:	Mr. Wilfred Schumacher Public Works & Engineering Department Water Pollution Control Branch Saskatchewan Environment Walter Scott Building 3085 Albert Street Regina, Saskatchewan
Manitoba:	Mr. Robert Duchominsky, Supervisor, Industrial Waste Control City of Winnipeg Winnipeg, Manitoba (204) 334-4385
Ontario:	Mr. R. Lahowy Manager, Waste Operations Regional Municipality of Waterloo Marsland Centre Waterloo, Ontario
	Mr. Robert Collins City of London London, Ontario

Mr. John Sanvido
Water Works Superintendent
City of Guelph
Guelph, Ontario

Mr. Tom Crozier
City of Stratford
Stratford, Ontario

Mr. V.M. Tait, Clerk
Town of Strathroy
Strathroy, Ontario

Messrs. Robert Wright and
Russell Romanick
City of Thunder Bay
Thunder Bay, Ontario

Mr. Mike Glynn
Supervisor, Industrial Waste
Regional Municipality of Niagara
St. Catharines, Ontario

Mr. V. Lim
Metropolitan Toronto
Water Pollution Control Division
Toronto, Ontario

Quebec:

Mr. Bernard Seguin
Montreal Urban Community
Chef d'Equite
Direction de l'assainessement de l'air et l'eau
Montreal, Quebec

Fredericton:

Mr. L.G. Corbett
Engineer, Sewer/Water Division
Fredericton, New Brunswick

4. MUNICIPAL SEWER USE CONTROL IN THE U.S.A.

4.1 Legislative Framework and Objectives

This sewer use control options study is concerned with the control of industrial waste as it is discharged to the municipal sewer systems. In the broader context of the MISA initiative, this study is concerned with the discharge of industrial waste to surface waters and the transfer of waste components to media other than water, e.g. sludge, air. In these regards it is useful to understand the general regulation of wastes in the U.S.A. so that we can focus on the legislation governing the discharge to municipal sewers in the general knowledge of how all waste is managed under U.S. law. Also, discussion of intermedia transfers from the water phase of industrial discharge to air and sludge is important to the overall integrity of the sewer use control programs. The pertinent laws in the U.S. are discussed below.

The five principal federal laws that govern waste and components of wastes are as follows:

- <u>Solid Waste Disposal Act, Title II, Resource Conservation and Recovery Act (RCRA)</u> is the umbrella legislation that defines waste in its many forms and sets out regulatory procedures to control the discharge of waste. Importantly, it exempts discharge to municipal sewers in its provisions.

- <u>Federal Water Pollution Control Act, Title III, Clean Water Act (CWA)</u> is the legislation with which this study is primarily concerned. It picks up on the exemption of the discharge to municipal sewers.

- Clean Air Act is the legislation that addresses air quality. Any contaminant volatilized from sewage would have to do so in compliance with this legislation.

- Comprehensive Environmental Response. Compensation and Liability Act (CERCLA) is the so-called "Superfund" legislation designed to identify and remediate the releases of hazardous wastes from abandoned waste sites.

- Toxic Substances Control Act (TSCA) is a complementary act that supports the above Acts and many other U.S. laws through identification and control of toxic chemicals.

These laws are applied at the local level by the adoption locally of the provisions of the laws and the approval of local programs by the U.S. Environmental Protection Agency (EPA). The approvals operate through the individual states down to the local municipal government where applicable. Failure to adopt suitable provisions at a lower level means that the next higher authority assumes legal responsibility. For some of the provisions inferred from the above list of laws, there is no need for local involvement in which case the federal authority is unique, e.g. TSCA.

In order to detail the objectives of the foregoing list of laws they are described in some limited detail below. By comparing and contrasting the objectives the general regulatory approach to waste is described.

RCRA was the first comprehensive environmental legislation addressing "solid waste" in the U.S. dating from 1976. It provides definitions for "solid" and "hazardous" wastes so

that the scope of the waste problem is delineated in law. Under RCRA, solid waste is defined[18] as "any material that is abandoned or disposed of, burned, or incinerated -- or stored, treated, or accumulated before or in lieu of these activities. The term includes essentially all forms of waste (i.e. solids, liquids, semi-solids, or contained gaseous substances)." RCRA covers all the waste receiving media; surface water, soil (sludge), ground water and air. Significantly, it exempts wastewater discharges to Publicly Owned Treatment Works (POTWs) i.e. sewage treatment plants and their coln systems. However, it does cover the management of waste for hazardous waste generators, transporters and treaters, specifically, the operators of Treatment/Storage/Disposal facilities (TSDF). A distinguishing feature of RCRA is that it covers <u>operating</u> facilities as opposed to abandoned ones.

The basis of designating a waste as hazardous parallels the basis for a similar designation under Regulation 309 in Ontario. The characteristics of ignitibility, corrosivity, reactivity and (leachate) toxicity are approximately the same as those found in the Ontario regulation. Similarly, a list of hazardous constituents is a basis for designating a waste as hazardous. There are some 375 chemicals on the list which is referred to as Appendix VIII to RCRA or is found in the U.S. Code of Laws at 40 <u>CFR</u> 261.

The CWA in contrast with RCRA deals only with wastewater and sludge. The CWA was passed in 1977 as an amendment to the 1972 Federal Water Pollution Control Act. Its goal is to restore and maintain the quality of surface water. It deals with industry and POTWs that discharge to surface waters and through subsidiary programs it deals with industrial

discharges to municipal sewers. Three programs that are important to this study on sewer use control have been established to meet the goal of the CWA:

- The National Pretreatment Program (NPP) which requires that industry pretreat its waste up to a technology based standard before discharging its waste to the <u>municipal sewers</u>.

- The National Pollutant Discharge Elimination System (NPDES) Program which provides technology and/or water quality based effluent standards that dischargers of waste to <u>surface waters</u> must meet and a permitting system to assure compliance.

- Water Quality based effluent limitations that reflect State requirements for water quality and pollutant loading. The EPA is mandated to oversee this program/

The local POTWs that are larger than 5×10^6 USGPD are required to develop control programs that are not less stringent than those prescribed by NPP. This is a requirement for the issuance of an NPDES permit. All other POTWs are required to obtain NPDES permits and meet NPP requirements if industrial pollutants can be shown to enter and pass through their systems.

The local POTW meet their NPDES requirements by implementing National Pretreatment Programs with their local industries. For toxic substances and pollution indicators (pH, etc.) the POTW uses Categorical Standards where appropriate. These are industry specific, technology based standards. The basis for designating a discharge as one that is subject to the

categorical standards are not as broad as the RCRA in which some 375 target chemicals are listed. For the CWA, 126 Priority Pollutants are identified as chemicals meriting sufficient concern in the U.S. to attract special attention when present in discharges to surface water.

In addition, there are other more general properties of waste that cause it to be regulated under the CWA. These are the "traditional" characteristics of waste or conventional parameters that are noted in most by-laws in Ontario at the present time. These are the Prohibited Discharges, discharges which:

- interfere with flow
- interfere with the normal operation of the STP (toxic)
- are corrosive
- are excessively hot
- are toxics passing through without degradation, or
- are flammable or explosive.

In addition, the CWA requires that any local water quality standards incorporated into the CWA provisions. For instance any local water quality standard that is exceeded by the POTW must be addressed in their local pretreatment program. In this way, local concerns that are not important enough for national attention are addressed effectively.

The CERCLA addresses the U.S. concerns over abandoned waste disposal sites, specifically those for which a release to the environment has been identified. Under this law the Superfund was established. Abandoned waste sites were and are being investigated to identify and priorize the sites on the National Priority Listing (NPL). Clean-ups of the

abandoned sites are being funded by Superfund which draws its resources from a special tax on chemical production. The processing and managing of wastes recovered from the abandoned sites is regulated under provisions of RCRA.

TSCA provides supplementary powers to regulate chemicals and therefore wastes containing the chemicals. It has the authority to regulate certain chemicals in detail, for instance, it is under TSCA that the detailed waste management for PCB containing wastes is regulated. TSCA also requires that manufacturers report new activities involving existing chemicals or new chemicals so that environmental impact can be assessed before deleterious impacts are incurred. In order to assist in this undertaking, TSCA also requires that certain tests be carried out on chemicals before first use or in an ongoing situation to determine the likely environmental and health impacts. TSCA provides this regulatory support not only to the Acts listed here but also to a variety of other Acts that protect people through things like drinking water and consumer products.

In the sections that follow the details of the Clean Water Act are discussed. The National Pretreatment Program and the National Pollutant Discharge Elimination System are clearly the parallel programs to the MISA initiative.

4.2 Control Programs under The Clean Water Act

The control programs have been introduced before: the National Pretreatment Program (NPP) and the National Pollutant Discharge Elimination System (NPDES) Program. As described above, NPP is the one that applies directly to the discharge of waste to the municipal sewers. However, the Pretreatment Program forms part of an NPDES permitted system

in a given municipality so that the two are sufficiently interrelated that both need to be described. Also, the NPP includes national effluent standards that have been developed under the NPDES Program further interlocking the two programs in the understanding of the local control of sewer use.

The initial work of the NPDES Program involved the evaluation of technology based effluent limitations. It developed performance based standards for effluent discharge controls categorized into 25 industrial classifications. (These so-called National Categorical Standards are discussed in more detail below.) In addition, where an industry did not fall into one of the categories, a site specific assessment is performed with reference to statutory guidelines. These standards are also considered in terms of other local, state water quality standard which are consistent with federal standards and the more stringent discharge limits become the permitted requirement at the given site. As part of the requirement to obtain an NPDES permit locally, a Pretreatment Program had to be established.

The NPP involved principally the General Pretreatment standards as described above. The objectives of the the pretreatment programs are[19]:

a) "to prevent the introduction of pollutants into POTWs which will interfere with the operation of a POTW, including interference with its use or disposal of municipal sludge";

b) "to prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works"; and

c) "to improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges."

Implicit in these objectives[18] is the protection of sewage system workers from exposure to chemicals.

In developing such programs reference is made on an industrial category basis to the National Categorical Standards. Finally, the local Pretreatment Program has to demonstrate that it has established a local system that meets the state and therefore the federal requirements for an effluent discharge control system.

4.3 Control Authorities

The control authorities under the CWA can be described by detailing the administrative levels of government that are authorized to control the discharges and the control programs that are administered by these levels of government. First, the control as a function of responsibility assigned is discussed in the abstract, that is, without reference to any specific control instrument. Then the control instruments which must be applied are discussed.

There is a hierarchy in the U.S. which places the federal EPA at the top. The EPA can delegate its ultimate authority to the state through an approval process that is guided by statute guidelines. A state program that has federal authorization can in turn delegate its authority to the municipal level. The state program and the municipal program must meet the requirements of the federal statute as a minimum.

State or local programs that do not meet EPA goals are not approved. In their place the federal or state program (respectively) are the ones that are empowered to act. In this way the EPA can be the controlling agency at the municipal level if needs be. In programs that are approved locally or at a state level, the EPA maintains the authority to audit and administer the provisions of the CWA insofar as ensuring that industries are complying with the standards.

In recognition that there are circumstances at a state or local level that may merit special consideration, each program that is delegated down to the next lower level of government must consider and incorporate any more stringent requirement that may exist. This provision includes any other local, state or federal provision that affects the discharge standards and applies even if the subordinate authority has not been approved to operate in their own state or municipality.

The following table summarizes the relationship of the local and federal authorities in an ideal system. Ideally, the CONTROL AUTHORITY will be the local government with the responsibilities outlined below. In this system the federal authority acts as the APPROVAL AUTHORITY with the responsibilities summarized below.

TABLE 4-1

RESPONSIBILITY SUMMARY

Control Authority	Approval Authority
- applies standards and other regulations to industry	- sets regulations
- monitors compliance	- approves state programs and in turn approves local programs through state programs
- undertakes compliance and enforcement actions	- steps in if POTWs found not to be in control
- ensures industrial user compliance	

4.4 Industries and Pollutants Controlled

As introduced above, the NPDES and Pretreatment Programs operate on the basis of categorical standards which are applied to all industry in a given category uniformly across the country. The description of the standards are provided in more detail in Section 4.5. The list of industrial categories is given below (Table 4-2). The list provides the general listing, but most listings are further subdivided. For instance, the foundries are subclassified into iron and steel, copper, aluminum, zinc, lead and magnesium. The complete listing, with subdivisions, is given in Appendix 5.

TABLE 4-2
CATEGORICAL PRETREATMENT INDUSTRY CLASSES

Adhesives and Sealants
Aluminum Forming
Coal Mining
Coil Coating
Copper Forming
Electroplating
Foundries
Inorganic Chemicals
Iron and Steel Manufacturing
Leather Tanning and Finishing
Metal Finishing/Mechanical Products
Non-Ferrous Metals Manufacturing
Ore Mining and Dressing
Organic Chemicals, Plastics and Synthetic Materials
Pesticides Chemicals
Petroleum Refining
Pharmaceutical Manufacturing
Plastics and Synthetics
Porcelain Enamelling
Pulp, Paper and Paperboard
Steam Electric Power Generation
Textile Industry
Timber Products

In addition, other industries not covered by these classifications are regulated on a case-by-case basis using standards based on statutory guidelines. Also new sources of water discharge are regulated under different standards, the so-called New Source Performance Standards (NSPS). These standards apply to new facilities or new effluent discharge facilities within existing industrial facilities. These standards can be stricter than the corresponding standards for existing dischargers and may be subject to environmental impact assessment.

The pollutants controlled can be classified into four areas:

- the Priority Pollutants; the 126 chemicals whose presence in a waste make the waste hazardous;

- the Prohibited Discharges; those collective physical and chemical properties which cause interference with the flow or operation of a STP, are corrosive or too hot, cause fire or explosion hazard, are toxic and pass through the STP unaltered, or, contaminate the sludge;

- non-conventional pollutants; special chemicals which are not found in significant amounts nationally to warrant inclusion on the federal Priority Pollutant list but in some localized circumstances are significantly hazardous;

- other pollutants covered by local limits; chemicals of localized interest but in this case the concern is based on a localized receiving water situation that renders harmless chemicals hazardous for instance by reason of concentration.

The Priority Pollutants are toxic organics and metals that have been identified to have a combination of toxicity and known occurrence in significant amounts in industrial discharges in the U.S. such that they warrant special attention. A complete listing of these chemicals is provided in Appendix 6. The use of this list in developing categorical standards is described in Section 4.5. In general, the approach is to establish a short-list of these chemicals for regular monitoring of discharges.

The Prohibited Discharges are those traditional chemical and physical properties of wastewater that have been covered by most sewer use controls in the recent past. These are the characteristics of wastewater that:

- pose a fire or explosion hazard;
- are corrosive;
- are too hot;
- upset the operation of the STP by toxic effects on the plant processes;
- obstruct the flow to the plant or in the operation;
- pass through the plant in an unaltered state or;
- contaminate the sludge.

The last two categories are omnibus provisions to protect the environment in special circumstances that are suggested by the very nature of the descriptions provided above.

4.5 Types of Standards Used

As introduced above there are three types of standards that apply:

- categorical pretreatment standards;
- prohibited discharge standards; and
- local limits.

The Categorical Pretreatment Standards are based on industry specific assessments of attainable effluent discharge concentrations based on best available technology (BAT). They are also applied to those and only those specifically identified industries. As indicated above, 25 industries are identified for regulatory attention. A separate regulation exists for

each industrial category. Furthermore, different processing options within an industry category are identified and separate limitations are placed on each subcategory.

The Pretreatment Standards as listed in the U.S. laws do not explicitly detail the best available technology (BAT). Rather studies have been commissioned to investigate the occurrence of target contaminants in an industry sector and the available technology for pollution abatement. Processing arrangements, alternate technologies and process economics were documented and published. Based on these studies, pre-treatment standards were published as proposals in the Federal Register, comments were incorporated in the standards and final rules were promulgated.

Within each subcategory, there are separate standards addressing effluent discharge and pretreatment situations (i.e. direct and indirect dischargers). Furthermore, existing and new source standards are addressed. Typically a listing for a subcategory is given in Table 4.3

In this listing, Sections 419.12 to 419.14 refer to direct discharges and Sections 419.15 to 419.17 refer to discharges to POTWs. The technology acronyms are defined as follows:

- BPT, best practicable control technology currently available, was used essentially as an interim standard from 1977-1984 when regulations were being written and other legal requirements were being fulfilled by the EPA.

- BAT, best available technology economically achievable, is the performances standard for the regulations as written for the toxics listed in the CWA plus local limits.

TABLE 4-3

PART 419 - PETROLEUM REFINING POINT SOURCE CATEGORY

Subpart A - Topping Subcategory

419.10 Applicability; description of the topping subcategory.

419.11 Specialized definitions.

419.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT).

419.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable (BAT).

419.14 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology (BCT).

419.15 Pretreatment standards for existing sources (PSES).

419.16 Standards of performance for new sources (NSPS).

419.17 Pretreatment standards for new sources (PSNS).

- BCT, best conventional pollutant control technology is the performance standard for the regulations of pollutants included in the Prohibited Discharges, the conventional parameters like pH, BOD, COD, oil and grease, etc.

Sections 419.15 to 419.17 differentiate between existing and new sources. The PSES is a concentration limit for existing sources, see Table 4-4. The NSPS is a mass limitation tied to the amount of production at the refinery, Table 4-5. Size factors and process configuration factors are included to illustrate the way the mass limits are established. Table 4-6 defines the PSNS. The chromium number is to be factored by the proportion of cooling tower flow to total refinery flow.

The foregoing example is typical of the industrial category where few items are listed in the regulation because through pre-regulation study, it was determined that these were the only contaminants and conventional pollutant indicators that were of a concern. An example of an industrial category where many more contaminants are listed is the Organic Pesticide Chemical Manufacturing Subcategory. Table 4-7 identifies priority pollutants found in pesticides manufactured in the U.S. The standards for BAT (direct discharge), NSPS, PSES and PSNS are given in Table 4-8. In addition this industrial category represents a special case where it is important to control the discharge of the pesticides being manufactured. Table 4-9 gives a partial listing of the 89 pesticides listed in this regulation.

TABLE 4-4
PSES FOR TOTAL REFINERY FLOW
FROM TOPPING CATEGORY

Pollutant or Pollutant Property	Pretreatment Standards for Existing Sources Maximum for any One Day
	(Milligrams per litre (mg/L)
Oil and Grease	100
Ammonia (as N)	100

TABLE 4-5
NSPS FOR TOPPING CATEGORY
PETROLEUM REFINING POINT SOURCE CATEGORY

Pollutant or Pollutant Property	NSPS Effluent Limitations: Maximum for Any One Day	NSPS Effluent Limitations: Average of Daily Values for 30 Consecutive Days Shall not Exceed
	Metric Units (kilograms per cubic meter of flow)	
BOD5	11.8	6.3
TSS	8.3	4.9
COD	61.0	32
Oil and Grease	3.6	1.9
Phenolic Compounds	0.088	0.043
Ammonia s N	2.8	1.3
Sulphide	0.078	0.035
Total Chromium	0.18	0.105
Hexavalent Chromium	0.015	0.0068
pH	6-9	6-9 pH units

(1) Size Factor

1,000 bbl of Feedstock Per Stream Day	Size Factor
Less than 24.9	1.02
25.0 to 49.9	1.06
50.0 to 74.9	1.16
75.0 to 99.9	1.26
100.0 to 124.9	1.38
125.0 to 149.9	1.50
150.0 or greater	1.57

(2) Process Factor

Process Configuration	Process Factor
Less than 2.49	0.62
2.5 to 3.49	0.67
3.5 to 4.49	0.80
4.5 to 5.49	0.95
5.5 to 5.99	1.07
6.0 to 6.49	1.17
7.0 to 7.49	1.27
7.5 to 7.99	1.39
8.0 to 8.49	1.51
8.5 to 9.99	1.64
9.0 to 9.49	1.79
9.5 to 9.99	1.95
10.0 to 10.49	2.12
10.5 to 10.99	2.31
11.0 to 11.49	2.51
11.5 to 11.99	2.73
12.0 to 12.49	2.98
12.5 to 12.99	3.24
13.0 to 13.49	3.53
13.5 to 13.99	3.84
14.0 or greater	4.18

TABLE 4-6
PSNS FOR TOPPING CATEGORY
PETROLEUM REFINING POINT SOURCE CATEGORY

Pollutant or Pollutant Property	Pretreatment Standards for New Sources - Maximum for any One Day (Milligrams per litre (mg/L)
Oil and Grease	100
Ammonia (as N)	[1] 100
Total Chromium	1

[1] Where the discharge to the POTW consists solely of sour waters, the owner or operator has the option of complying with this limit or the daily maximum mass limitation for ammonia set forth in §419.16(a) and (b) (Table 4-4).

TABLE 4-7

PRIORITY POLLUTANTS REGULATED IN PESTICIDE ACTIVE INGREDIENT MANUFACTURING WASTEWATERS

Column A Pesticide Active Ingredient	Column B Priority Pollutant Regulated
Acephate	Methyl chloride
	Toluene
Alachlor	1,2-Dichloroethane
	Chlorobenzene
Aldicarb	
Alkylamine	
Allethrin	
Ametryne	Cyanide
	Toluene
Aminocarb	
Amobam	
Anilazine	1,2-Dichloroethane
	Cyanide
AOP	
Aquatreat DNM 30	
Aspon	Toluene
Atrazine	Cyanide
	Carbon tetrachloride
	Toluene
Azinphos methyl	1,2-Dichloroethane
Barban	Toluene
	1,2-Dichloroethane
BBTAC	
Bendiocarb	
Benfluralin	
Benomyl	
Bensulide	Benzene
	Toluene
Bentazon	Carbon tetrachloride
	Chlorobenzene

Partial Listing

TABLE 4-8

PRIORITY POLLUTANTS EFFLUENT LIMITATIONS AND STANDARDS FOR BAT, NSPS, PSES AND PSNS

Priority Pollutants	Maximum for Any One Day (mg/L)	Monthly Average Shall Not Exceed (mg/L)
Benzene	0.057	0.021
Chlorobenzene	0.045	0.023
Toluene	0.035	0.018
1,2-Dichlorobenzene	0.11	0.040
1,4-Dichlorobenzene	0.045	0.018
1,2,4-Trichlorobenzene	0.13	0.055
Methyl Bromide	0.15	0.042
Carbon Tetrachloride	0.13	0.038
Chloroform	0.075	0.031
Methyl Chloride	0.11	0.032
Methylene Chloride	0.56	0.16
Cyanide	0.64	0.22
Bis(2-chloroethyl)ether	zero	zero
2,4-Dichlorophenol	0.050	0.023
2,4-Dinitrophenol	0.12	0.034
4-Nitrophenol	0.050	0.019
Pentachlorophenol	0.25	0.15
Phenol	0.040	0.017
Copper	0.27	0.13
Zinc	0.26	0.18
1,2-Dichloroethane	1.0	0.41
Tetrachloroethylene	0.085	0.034
N-nitrosodi-n-propylamine	0.090	0.028
1,3-Dichloropropene	zero	zero
Hexachlorocyclopentadiene	0.13	0.037
a-BHC-Alpha	0.090	0.032
b-BHC-Beta	0.090	0.032
d-BHC-Delta	0.090	0.032
g-BHC-Gamma	0.090	0.032
a-Endosulfan-Alpha	0.090	0.032
b-Endosulfan-Beta	0.090	0.032
Endrin	0.18	0.057
Heptachlor	0.090	0.032
Toxaphene	0.005	0.002

standards into play. The water quality standards are the ones that the POTW has to meet to stay within the provisions of its NPDES permit. These standards are developed locally by the State but are reviewed and approved by the EPA. They are developed either by:

- pollutant specific approach or
- biomonitoring approach

The pollutant specific approach is used when the pollutant is well-quantified and its effects and interactions in the receiving water are well understood. It is said[20] this approach should be used when human health effect are a concern or bioaccumulation of the pollutant occurs. The biomonitoring approach evaluates overall receiving water impacts using biological techniques. The overall effect of the discharge is indicated by the biological systems rather than attempting to assess the effect of individual pollutants in a complex mixture.

The Specific Prohibitions prevent discharge of pollutants that:

- cause explosion or fire hazard;
- upset the operation of the POTW;
- are corrosive or are at pH <5.0;
- are solid or viscous materials that can obstruct flow; or
- cause temperatures at the STP to exceed 40°C.

The Local Limits are locally derived numerical limits on the discharge of pollutants to the POTW collection system. They usually apply at the point of discharge and specify numerical limits for a set of parameters drawn from the EPA 126

It is noteworthy that all effluent limitations (BPT, BAT, BCT) need not be specified. In general the new source performance standards are stricter than the existing.

These standards can be adjusted in three ways, viz:

- Net/Gross Adjustment
- Removal Credit
- Fundamentally Different Factors Variance.

The Net/Gross Adjustment allows for the presence of a pollutant in an industrial users water intake.

The Removal Credit (until it was challenged) allowed higher discharge limits if the POTW was able to remove the pollutant effectively so that the POTW discharge limitation would not be violated.

In Fundamentally Different industrial situations, the discharge limit can be raised or lowered to reflect factors originally not considered by the EPA in establishing these limits.

The Prohibited Discharge Standards apply to all industry, whether or not they are specifically identified for categorical standards. The prohibited discharge standards have:

- General Prohibitions; and
- Specific Prohibitions

The General Prohibition prevents the discharge to a POTW of a pollutant that passes through the POTW or interferes with the operation of the POTW. The General Prohibition against discharge that passes through or interferes with the operation of the POTW brings water quality-based effluent

standards into play. The water quality standards are the ones that the POTW has to meet to stay within the provisions of its NPDES permit. These standards are developed locally by the State but are reviewed and approved by the EPA. They are developed either by:

- pollutant specific approach or
- biomonitoring approach

The pollutant specific approach is used when the pollutant is well-quantified and its effects and interactions in the receiving water are well understood. It is said[20] this approach should be used when human health effect are a concern or bioaccumulation of the pollutant occurs. The biomonitoring approach evaluates overall receiving water impacts using biological techniques. The overall effect of the discharge is indicated by the biological systems rather than attempting to assess the effect of individual pollutants in a complex mixture.

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- are solid or viscous materials that can obstruct flow; or
- cause temperatures at the STP to exceed 40°C.

The Local Limits are locally derived numerical limits on the discharge of pollutants to the POTW collection system. They usually apply at the point of discharge and specify numerical limits for a set of parameters drawn from the EPA 126

priority pollutants that apply to the local situation. The limits are usually designed to protect the operation of the STP, to protect the POTW from violating its NPDES permit by passing pollutants through and preventing contamination of the sludge. Local Limits also incorporate local or state regulations on toxics in waste water and sludge. The more stringent criterion is the one chosen as applicable in all cases.

Another factor in deciding on the Local Limit that is applied is the allocation of pollutant loading. The POTW considers the total loading with respect to all pollutants in their STP and their sewage collection area relative to the treatment capability, sludge quality and NPDES effluent limits. For each pollutant there is an ultimate loading (concentration or mass) that is acceptable in their system. POTWs are required to allow a portion of that total amount for spill contingency and future development. Whatever is left over is allocated to industry in their collection area balancing mass and concentration factors.

4.6 Approvals and Permits

The overall approval structure was described previously. The EPA acts as the primary approval authority but can delegate the power to the state level. The state (or the EPA in the absence of approved program) in turn approves the action of the control authority which is a local administrative entity. Even in state approved programs the EPA retains the authority to audit compliance and take enforcement actions. The permit issued by the state or the EPA is a SPDES (S=State) or NPDES permit which permits direct discharge to surface waters provided certain permit conditions have been met. In mid-1986, 21 states had EPA approved programs[8].

The elements of a local program that must be present are outlined as follows:

- Industrial Waste Survey; a characterization of industrial activity and wastewater discharges to POTWs in the local collection area. The survey is to be confirmed by data collection and on-site verification.

- Local Ordinance (U.S. term for by-law) must be in place setting out legal authority, type of local permit and specific pretreatment or prohibited discharge standards by reference to SPDES/NPDES permits.

- Local Limits must be established based on technical studies of discharges to POTW collection systems, receiving water quality, sludge quality and STP operation.

- Monitoring program must be in place to determine compliance.

- Administrative procedures must be in place to implement the program.

- Resources have to be identified for the administration of the local program.

The EPA allows a wide latitude in the type of local permitting that establishes the arrangement between the POTW and the industrial user. All techniques should reference an ordinance (by-law). The arrangement can be a permitting system where the use of the sewer is tied to a permit with conditions centered on the ordinance but specifying location, amounts and quality of discharge. Another mechanism is a contract where the POTW is in the position of a supplier of

services subject to conditions that are referenced to the ordinance. Finally, the local authority can use an administrative order to require compliance with an ordinance.

4.7 Record Keeping and Reporting

The record keeping and reporting responsibilities follow the authority mechanisms in place under the CWA. There are essentially two interfaces across which reporting must take place and for which records must be kept to support the reports, namely:

- POTW reports to the Approval Authority, State or EPA.

- Industrial User (IU) reports to the Control Authority, usually the POTW.

The POTW must, in establishing programs, survey industry in their collection area to identify the types and amounts of waste produced by industry using their system. The POTW must keep the record of the original survey and must update the record regularly. A monitoring program must be in place to verify the IU survey. The POTW will summarize the foregoing in a report to the control authority detailing the status of IU compliance.

Enforcement actions taken against IU's also have to be summarized and reported. This information is part of a general report on the status of the local pretreatment program.

The POTW must also report on the treatment work's performance in treating collected wastes. This requirement is part of the NPDES permit under which the POTW operates.

In developing compliance, the IU must submit three reports; a baseline report, a compliance schedule progress report and a 90-day compliance report. As indicated by their names, these are progressive reports on compliance status, with commitments to upgrading towards a final compliance status.

Once in compliance, routine half-yearly compliance reports are required detailing compliance (supported with analysis and flow data). These may be self-monitoring reports, although proper QA/QC and notification of self-monitoring activities ensure compliance. Unusual discharges (slug loadings), whether planned or not, must be reported. Obviously spills are reported after the fact although quick action is required in the event of spills.

4.8 Inspection and Sampling

The inspection and sampling programs under the CWA follow the two-tiered control approach of the Act. The approval authority, state or EPA monitors the local POTW for:

- NPDES permit compliance
- pretreatment compliance.

In doing so, the approval authority, for pretreatment compliance may duplicate the POTWs inspection and sampling program as applied to the IUs. As such, the pretreatment compliance inspection programs can be a single report prepared by the IU.

The approval authority for the NPDES can inspect all things dealing with the NPDES permit, including local records, operating documentation, processes, the operation and monitoring thereof and all facilities. Under the pretreatment program, inspection procedures at POTWs have been established under the following headings:

- compliance evaluation
- compliance sampling
- performance audit
- diagnostic inspection
- others (like toxics sampling and biomonitoring)
- overview of IU inspections by POTW
- sampling at IUs
- QA/QC inspections.

The last three items on this list are the routine inspections carried out by the POTWs on their own IUs. The list is comprehensive, the inspectors, whether state, EPA or local, have unrestricted access to facilities and records and they can appear unannounced.

4.9 Enforcement

There are two mechanisms to enforce the provisions of the CWA relative to non-compliance with the POTWs discharge control. These are, i) injunctions and ii) civil and criminal penalties.

Injunctive powers are written into ordinances and can be supported by precedence, if required.

A summary of the types of penalties is given below. Reference to emergency powers means that emergency halting of operations is possible where public health, the environment or the POTW operation is threatened.

TABLE 4-9
PENALTIES

Federal Authority:

- Civil penalties up to $10,000/day per violation
- Criminal fines up to $25,000/day and/or imprisonment up to one year per violation
- Civil remedies.

State Authority:

- Civil penalties up to $5,000/day per violation
- Criminal fines up to $10,000/day per violation

POTW's Authority:

- Typical penalties range from $100 to $1,000/day
- Also emergency relief.

4.10 Contacts Made in the United States

The structure of the US program, with the ultimate authority vested with the US EPA and delegated authority down to the state and local levels, dictated that each of the levels of government be contacted.

As outlined above, the Clean Water Act which controls municipal sewage systems is implemented through the Office of Water. The latter is a line function directly below the Administrator and Deputy Administrator for the USEPA. A number of line functions under the Office of Water deal with drinking water, municipal pollution control, regulations and standards, enforcement and permits, marine and estuarine

protection and groundwater protection. For information on the CWA system for municipal sewer systems a contact in the Office of Enforcement and Permits was made viz:

Mr. Tim Dwyer
Permit Section
Office of Enforcement and Permits
US EPA
Washington, D.C.

Since the program of sewer use control in the US can be implemented through a state program that matches or exceeds the provisions of the federal program, it was necessary to contact state authorities to get their input into the US system. In order to provide real information from experience on fully developed state programs, it was necessary to go to the states that had EPA approved programs. New Jersey and New York were chosen as states to contact, New Jersey because they are reputed to have among the more highly developed environmental control programs and New York because of the pending EPA approval of its program and the geographical identity with Ontario in the Upstate Region. Contacts made were:

Mr. Wm. Boehle
New Jersey Department of Environmental Protection
Bureau of Industrial Waste Management
401 E State Street
Trenton, New Jersey 08625

Mr. Joseph Kelleher
Technology Transfer Unit
Water Division
New York State Department of Environmental Conservation
Albany, New York

Since the authority over sewer use can be further delegated to the local level, it was important to develop contacts at the local level to learn about the law's application at the lowest (operating) level. In selecting the municipalities to contact, their size, effluent receiving watercourse and type of program were considered. In particular, municipalities were chosen to reflect parallel situations in Ontario. The following table reviews the decisions:

City	Size	Discharge
Milwaukee	Medium	Lake Michigan
Port Huron	Small	St. Clair River
Buffalo	Medium	Niagara River
Philadelphia	Large	Schuykill River
Chicago	Large	Mississippi Diversion

The City of Rochester was originally selected as an additional Great Lake discharge but declined an interview.

The contacts made were as follows:

Mr. J.L. Schultz
Manager - Industrial Waste
Milwaukee Metropolitan Sewage District
735 North Water Street
Milwaukee, Wisconsin 53202-4151

Mr. Daniel Collins
Pollution Control Inspector
Wastewater Treatment Plant
100 Merchant Street
Port Huron, Michigan 48060

Mr. Don Menno
Industrial Waste Administrator
Buffalo Sewer Authority
Foot of West Ferry Street
Buffalo, New York 14213

Mr. Tom Healey
Chief - Industrial Waste Unit
City of Philadelphia
1 Reading Center
Philadelphia, Pennsylvania

Mr. Richard Lanyon
Assistant Director, Research and Development
Department
The Metropolitan Sanitary
District of Greater Chicago
111E Erie Street
Chicago, Illinois 60611

5. MUNICIPAL SEWER USE CONTROL IN THE U.K.

5.1 European Community Directives

The European Community (EC) countries cooperate on a broad range of issues affecting their mutual economic interests. Environmental concerns are included since environmental regulation can affect economic competitiveness. In 1976 the European Community Council adopted a Directive to address pollution caused by "dangerous substances discharged into the environment"[15]. The Directive[16] established two lists of chemicals, List I and List II for which the following definitions are appropriate:

- List I consists of chemicals for which pollution must be eliminated. List I is often referred to as the "black list" because of this proscription of discharge. These are compounds that are particularly dangerous because of their toxicity, persistence and bioaccumulation.

- List II consists of chemicals for which pollution should be reduced. List II is often referred to as the "grey list" because these chemicals are less dangerous but still have a deleterious effect on aquatic life.

The EC has published a list containing 129 potential List I compounds (Appendix 7)[21]. The chemicals appearing in List I are presently going through an initial evaluation in a manner similar to that used for the EMPPL. Compounds that are identified as List I substances are the subject of a Directive to which the EC countries have agreed to adhere. At present, Directives have been adopted for fewer than 20 of the target compounds. The evaluation process will be ongoing, with new target compounds identified and existing List I chemicals re-evaluated.

List II compounds are those for which the List I evaluation has not been complete or where the List I evaluation has not resulted in a Directive but residual effects on the aquatic environment exist. At present all the target compounds (Appendix 7) that have not been promoted to List I are List II compounds. List II compounds are controlled nationally at the perogative of the country. In England for example, List II presently includes eight common metals: arsenic, chromium, copper, lead, nickel, zinc, tin and vanadium.

The implementation of the List I Directives is also mandated by the EC Directive on Dangerous Substances. List I compounds are to be controlled by either an:

- Environmental Quality Objective (EQO); or a
- Uniform Emission Standard (UES).

List II compounds are to be controlled by the EQO approach.

The UES is a minimum water quality (discharge) standard that would be applied uniformly in a jurisdiction. The EQO approach takes into account the receiving water and is the approach preferred in England.

There is a conflict in terminology between the EC and England. In the EC legislation, the EQO is defined as "the concentration of a substance which should not be exceeded in the receiving water measured sufficiently close to the discharge".

In England, EQO is defined as:

> "the requirement that a body of water should be suitable for those uses identified by the controlling authority".

and the EQS:

> "that concentration of a substance which must not be exceeded if a specific use of the aquatic environment is to be maintained".

Thus the English EQS is equivalent to the European Community EQO.

In England designated uses of water have been listed as follows:

DESIGNATED USES OF WATER

		Freshwater	Saline Water
i)	For direct abstraction to potable supply	Yes	No
ii)	For abstraction into impoundment prior to potable supply	Yes	No
iii)	As a source of food for human consumption	Yes	Yes
iv)	Protection of fish and commercial shell fish	Yes	Yes
v)	Protection of other aquatic life	Yes	Yes
vi)	Irrigation of crops	Yes	Yes
vii)	Watering of livestock	Yes	No
viii)	Industrial abstraction	Yes	Yes
ix)	Bathing and water contact sports	Yes	Yes
x)	Aesthetic considerations	Yes	Yes

Pollution control in England is implemented by specifying the use of the water (EQO) and selected the appropriate standard (EQS) set for the protection of the particular uses. If more than one use is specified for a particular stretch of water the most stringent EQS is applied. Consents for discharges are set so that the EQS in the receiving water is not exceeded. Depending on the substance, standards in the receiving water are expressed as annual mean or 95 percentile.

EC Directives are not related to use although different standards are generally given for fresh and marine waters. However, the EC has also issued use specific Directives such as the Directive on the quality of surface water intended for the abstraction of drinking water[22], which can include standards for List I substances.

5.2 Administrative Structure in the U.K.

The United Kingdom has a constitutional and hereditary monarchy. It has a two-chamber Parliament - the House of Commons and the House of Lords. The Executive is the National Government.

Local government is carried out:

In England and Wales - by over 50 county councils divided into more than 350 district councils;

In Scotland - by nine regional councils subdivided into some 50 district councils and three island councils;

In Northern Ireland - by 26 district councils.

The four countries comprising the United Kingdom each have a certain degree of autonomy. This is reflected in the different arrangements for water services administration in England, Wales, Scotland and Northern Ireland (Section 5.3).

5.3 Legislative Framework and Objectives

Parliament enacts the laws governing the control of pollution including the control of sewer use. Proposed legislation is usually published initially in "White Papers" allowing interested parties to comment before drafting of the law. The draft law is then discussed in a Committee of the House of Commons before transfer to the House of Lords where it is also discussed in Committee. The proposed law is then put to the vote in the House of Commons and the House of Lords. If passed, it finally requires Royal assent before becoming effective.

The Secretary of State has the power to issue orders giving instructions for implementation of the laws. In addition the Secretary of State has the power to make "variation orders" to the regulations within the scope of the law. Interested parties have the opportunity to make suggestions to the Secretary of State as to the content of these "orders". The "orders" are usually issued in the form of "Statutory Instruments". The usual procedure for changing laws in the U.K. is to repeal certain sections of existing legislation and to issue new regulations in a new Act.

The U.K. legislation on the control of discharges to sewers dates back to the Public Health Act of 1936 which empowers a water authority to construct public sewers and sewage treatment works and requires that the Authority must exercise these functions without creating a nuisance. Under the Act

it is an offence to discharge into a public sewer any matter (including steam or liquid at a temperature higher than 100°F and petroleum spirit) likely to damage the sewer or the treatment process, or to throw or deposit ashes, bricks, rubbish, filth or any other matter likely to cause annoyance, into any river or stream.

The Public Health Act of 1936 was amended and strengthened by the Public Health (Drainage of Trade Premises) Act of 1937 and the Public Health Act of 1961. These Acts are concerned with regulating discharges of trade effluents to the public sewers. The 1937 Act gives industrial dischargers a right, subject to the consent of the water authority, to drain into public sewers. In order to safeguard the fabric of the sewers, the treatment processes at sewage works and, of course, the condition of the waters to which the treated mixed effluents will ultimately be discharged, authorities are empowered to impose quality and quantity conditions on the dischargers and to make charges for conveyance and treatment. There is provision for appeal to the Secretary of State against a refusal to give a consent or against any conditions imposed in a consent, including the charge levied for the conveyance and treatment of the trade effluent.

The Water Act of 1973 was responsible for the reorganization of the water industry in England and Wales. On 1 April 1974, nine regional Water Authorities (WAs) in England and the Welsh Water Authority in Wales became responsible for the functions of water supply, sewerage, sewage treatment, the management and development and control of rivers and aquifers and all uses of water associated with them, land drainage and flood prevention and fisheries. Previously these duties had been shared between some 200 water undertakings, 1,400 local authorities and 29 river authorities. For the first time England and Wales had single authorities each responsible

within its own area for all aspects of the water cycle. The reorganization left 29 water companies in being but as agents of the water authorities responsible for the water supply to certain parts of the water authorities. Similarly, sewerage (but not sewage treatment and disposal) is managed under agreement by some district councils and London boroughs for the water authorities. The water authorities were also given important new functions in relation to recreation and amenity.

This Act also states that discharges by water authorities require consent by the Secretary of State.

<u>The Control of Pollution Act Part II 1974</u> amends and strengthens further existing legislation in the control of water pollution including the control of discharges to sewers.

Although the Act was passed in 1974, implementation of most principal sections of Part II (relating to water pollution) did not commence until 1983. The delay was caused due to concern that the Act was going to lead to increases in costs for water authorities and industry particularly as it also included for the first time the control of discharges made to estuaries and coastal waters. The remaining clauses will be implemented over the next few years but the principal powers and responsibilities are now in force.

The implementation of the laws was coordinated in the past by the National Water Council which was set up under the Water Act of 1973 and consisted of the Chairmen of ten water authorities and ten representatives appointed by the Secretary of State for the Environment and the Minister of Agriculture, Fisheries and Food. The National Water Council was dissolved by the Water Act 1983. The coordination

function for the implementation of the regulations and the advice function to the Government is now carried out by the Water Authority Association which is made up only of the Chairmen of the 10 water authorities and their representatives.

The control of discharges to sewers and to surface waters is vested in the water authorities with an appeal provision to the Secretary of State for the Environment. The water authorities lay down the consents for industrial discharges both to sewers and surface waters and also for their own discharges, e.g. sewage effluents. However, the consents for the sewage effluent discharges require the approval of the Secretary of State. The water authorities also carry out the monitoring of the consents, including their own. The results of the monitoring of the consents to surface waters are available to the public for scrutiny and prosecution. The results of the monitoring of the indirect discharges is confidential to the water authority. However, it is currently being discussed to make these results also available to the public.

Very recently the Department of the Environment (DOE) has set up "Her Majesty's Directorate of Pollution" which has four departments - Radioactive Wastes, Airborne Wastes, Waste Disposal to Land and Discharges to Waters.

The Discharges to Waters Inspectorate will:

1. Issue consents for water authority discharges;
2. Monitor and enforce quality standards, including implementation of European Community (EC) Directives;
3. Audit water authority sampling and monitoring procedures;

4. Give technical advice to water authorities on solutions to water quality problems.

Therefore, once the Inspectorate is fully operational there will be some outside control over the water authorities' own discharges which in turn could lead to repercussions for the consents/controls of discharges to sewers.

The control of discharges to surface waters in the U.K. is based on the Environmental Quality Objectives (EQO) and Environmental Quality Standard (EQS) approach. The EQO defines the designated use of the receiving water. For instance, it might be designated as a raw water source for potable supply. The EQS is the concentration of a particular substance which must not be exceeded or in certain cases must be achieved (e.g. dissolved oxygen) in order that the water is suitable for the designated use. For EC black list compounds, the EQS values laid down in the different EC Directives are being applied. For EC grey list compounds National EQS values for the different water uses are set by DOE in consultation between industry and the water industry taking into account EC Directives issued for particular uses (such as the EC Directive for the Protection of Fresh Water Fish). National EQS values are communicated to the water authorities in the form of "Circular Letters" issued by the Secretary of State for the Environment.

5.4 Administrative Structure for the Control of Discharges to Surface Waters and Sewers

The four countries comprising the U.K. have different arrangements for the administration of the water services:

a) England and Wales

The water industry is composed of 10 autonomous multi-functional water authorities (nine in England, one in Wales). The geographical areas of these authorities conform to river basins and within those areas each authority is responsible for all aspects of the water cycle. Only in parts of some water authorities is the water supply function carried out by 29 private water companies who act as agents to the water authorities in their supply area. In addition some of the sewerage function is carried out by local authorities as agents to the water authorities.

b) Scotland

In contrast to the system in England and Wales, the responsibility for pollution prevention in Scotland is separated from that for water supply, sewerage and sewage disposal. Thus, responsibility for pollution prevention and for the protection of surface waters lies with seven River Purification Boards and three Island Councils, whereas responsibility for water supply, sewerage and sewage disposal rests with the nine Regional Councils (whose boundaries are based on districts and not on catchments) and Island Councils.

c) Northern Ireland

The Water Services of the Department of the Environment (Northern Ireland) is the sole water and sewerage agency in Northern Ireland. It is multi-functional in nature and in many respects resembles a water authority in England and Wales.

The responsibilities for monitoring of surface waters and discharges to sewers in the United Kingdom are given in Table 5-1.

TABLE 5-1
RESPONSIBILITY FOR MONITORING OF SURFACE WATERS and DISCHARGES TO SEWERS IN THE U.K.

	Surface Waters	Sewerage System
England and Wales	Water Authority	Water Authority
Scotland	River Purification Boards or Island Councils	Regional Councils Island Councils
Northern Ireland	DOE (Northern Ireland) Water Services Dept.	DOE (Northern Ireland) Water Services Dept.

Although the administrative arrangements in England and Wales, Scotland and Northern Ireland are different, the sewer use control regulations are the same in the different parts of the U.K. In the discussions of the regulations emphasis is therefore placed on the situation in England and Wales only.

5.5 Sewer Use Regulations

The different laws cited in Section 5.3 regulate the sewer use in the U.K. The setting and monitoring of the consents for the discharge to sewers is vested in the water authorities.

The industry requires a Consent, or for insignificant discharges an Agreement, from the water authority to discharge to sewers. The significance of a discharge is determined by the amount of waste, the concentration of contaminants contained, and, the receiving watercourse characteristics. The discharger has to submit a "Standard Trade Effluent Notice Form" together with the attached "Additional Information Sheet" providing a detailed description of the effluent. The discharger has also to submit suitable plans on the layout of his drainage system. A survey of the premises will then be performed, if necessary, by a Pollution Control Officer of the water authority who has to complete a "Preliminary Particulars Form" outlining his findings. Where necessary the discharger is given a brief outline of the Control and Charging Scheme of the authority with likely limits and other requirements such as metering and provision of sampling points.

The Consent for the discharge to the sewer is issued by the Division of the water authority but requires approval by Head Office. The discharger is told in writing by recorded delivery to the Company Secretary or equivalent person in a private company or partnership. The Consent bears the signature of the Divisional Manager or his deputy. The discharges to sewers are controlled by the Trade Effluent Officers of the Water Authority Division and the samples are analyzed by the scientific staff of the division. The sewage treatment works are operated by the divisional operating staff.

Consents should be issued within two months of application. A discharger has the right to appeal to the Secretary of State for the Environment against conditions given or imposed in a Consent, or against the refusal of a Consent.

Directions are issued to vary the conditions laid down in a Consent or previous Direction. Directions varying the Consent or previous Directions may not be issued within two years from the date of the Consent or previous Direction without the discharger's written consent.

The Water Authority sets the Consents taking into account information available on the effect of the substance on the sewage treatment process and on the receiving water and sludge disposal. The Water Authority can ask the industry to provide missing toxicity data. The Consents are derived taking into account the dilution available due to the sewage effluent and the receiving water flow rate and the removal in the sewage treatment works. Consents are usually given in terms of concentration and flow rate or volume. Table 5-2 provides a list of typical Consent limits, however, these can be tighter depending on the size of the sewage works, size of the receiving water and quality objective of the receiving water (e.g. salmonid river or Class 4 river) and sludge disposal route.

To the application for a Consent is also attached a list of substances which, if present in the effluent, must be indicated by the discharger and for which Consents therefore can be set (Table 5-3).

Sewage sludge to agricultural land is regulated by DOE Guidelines based on EC Directive. Sludge to agricultural land is monitored by the water authorities. The Dumping at Sea Act requires a licence from the Ministry of Agriculture, Fisheries and Food (MAFF) for disposal of sludge to sea. Incineration of sludge is not included in any air pollution legislation; it is outside the definition of the Alkali Act controlling air pollution from major plants. However, as

TABLE 5-2

TYPICAL LIMITS APPLIED TO DISCHARGES TO SEWERS

Substance	Concentration* (mg/L)
Heavy Metals	2-10 Total in solution 5-30 total in solution and suspension
Cadmium Arsenic Mercury Selenium Silver	<1
Lead Chromium Nickel Tin Copper	2-5
Zinc	5-10
Sulphide	1-10
Cyanide	1-10
Phenols	5-20
Ammonia-N	<250
Chlorinated hydrocarbons	0-1
Sulphate	300-1000 as SO_3
Oil	shall not contain physically separable dispersed or emulsified oil

* Ranges indicate limits applied depending on significance of discharge to size of sewage works and receiving water quality.

TABLE 5-3

SUBSTANCES REQUIRING NOTIFICATION WHEN PRESENT* IN WASTE

COMPOSITION

Substance Required to be Indicated

1. Mineral acids
2. Alkalis
3. a) Metals and their compounds

   b) Iron, aluminum, antimony, arsenic, beryllium, chromium, copper, lead, nickel, selenium, silver, tin, vanadium, zinc, cadmium, mercury
4. Cyanides or compounds containing cyanide
5. Salts including:

   Nitriles, chlorates, fluorides, sulphates, hypochlorites, nitrates, nitrites, perchlorates, sulphides, carbides
6. Phenols, cresols and simple derivatives.
7. Tar and tar oils.
8. i) Mineral oils
   ii) Oil emulsions
   iii) Grease
9. Ammonia or ammoniacal compounds.
10. Paint wastes (as sludges)
11. Pharmaceuticals including steroids and hormones.
12. Surface active agents.
13. Organohalogen compounds, including pesticides and degreasing agents.
14. Organosulphur compounds containing nitrogen.
15. Organophosphorus or organosilicon compounds.
16. Acrylonitrile.

18. Carbohydrates.

19. Yeast.

* Waste for which an application for Consent has been made.

TABLE 5-3

SUBSTANCES REQUIRING NOTIFICATION WHEN PRESENT* IN WASTE (continued)

COMPOSITION

Substance Required to be Indicated

20. Petroleum or any other substances capable of producing flammable or toxic vapours including calcium carbide and carbon disulphide.

21. Solvents including: Alcohols and nitration products, ketones, esters, ethers, hydrocarbons including benzene, toluene and xylene and their industrial equivalents.

22. Cooling water.

23. Boiler blowdown.

24. Scrubbing water.

25. Any other substance known to be toxic or hazardous

NATURE OR COMPOSITION

Explanatory Notes

Sewage works depend for their effectiveness on biological treatment processes. It is therefore necessary for the nature and composition of trade effluents to be defined clearly and in detail, including:

a) Process or processes from which wastewater originates, giving the name of the process and the precise materials to be processed or produced.

b) All additives or chemicals used in each process where they will remain, to whatever degree, unchanged in the process, and therefore present in the effluent.

c) The substances likely to be present in the effluent as the result of operating the process, including substances removed from items processed.

The Composition Schedule attached to the Trade Effluent Notice sets out the classes of materials which the Authority may wish to control if present in the effluent discharged to the sewer. The applicant is asked to identify which of these substances, together with any other substances known to be toxic, might be present in the trade effluent.

soon as anything else is burned with the sludge then this activity falls under the Alkali Act. The only restrictions placed on the air emission from sludge incinerators at present relate to the planning regulations which are administered by the district councils. The planning regulations require "no nuisance" and less than 0.1 particulate matter/cubic foot of air.

Disposal of incinerator ash falls under the landfill disposal regulations. The landfill site has to be authorized to accept the ash. District councils are the responsible waste disposal authority.

If sewage sludge is disposed to landfill, the landfill again has to be authorized to accept the sludge.

Discharge of pretreatment residues from industry is regulated under Control of Pollution Act Part I (COPA I). There is a statutory right for consultations of the water authorities under COPA I for certain landfill operations. This can also trigger a public enquiry. Discharges from landfill sites require Consents from water authorities under COPA II and might require treatment before discharge to the sewer. Landfill sites are operated by local or district councils or private companies and are controlled by local waste disposal departments of the district councils. The newly formed Waste Disposal to Land Inspectorate, which is part of the Department of the Environment advises the waste disposal authorities on the licensing and operation of disposal sites and seeks to ensure the protection of health and the environment. It also monitors the management of especially hazardous waste from the cradle to the grave.

The standard National Water Council/Confederation of British Industry (NWC/CBI) formula is used for calculating effluent

charges. But actual charges vary slightly between WAs depending on the actual average treatment costs in the respective WAs.

Costs taken into account in calculating trade effluent charges are generally based on those works receiving trade effluent only. Some authorities use total flows, others use foul flows only. The present charging formula used is based on the Mogden type formula.

$$C = R + V + \frac{OtB}{Os} + \frac{St}{Ss} * S$$

Where:

C	=	total charge for trade effluent treatment
R	=	reception and conveyance charge
V	=	volumetric and primary treatment costs/m^3
Ot	=	the chemical oxygen demand (COD) of effluent after one hour quiescent settlement at pH7
Os	=	COD of crude sewage after one hour quiescent settlement
B	=	biological oxidation cost/m^3 of settled sewage
St	=	total suspended solids (mg/L) of the trade effluent at pH7
Ss	=	the total suspended solids (mg/L) of crude sewage
S	=	treatment and disposal costs of primary sludges/m^3 of sewage

Some authorities use suspended solids in the calculations, others use settleable solids.

The variation in charges and average regional strengths used can be seen from Table 5-4.

TABLE 5-4

TRADE EFFLUENT CHARGES 1985/86

	Average Regional Strength		Apportionment of Charge					Minimum Charge
	Os mg/L	SS mg/L	R p/m^3	V p/m^3	B p/m^3	S p/m^3	Total p/m^3	£
Anglian +	680	400	4.64	5.79	8.47	3.19	22.09	40
Northumbrian	353	178	7.52	4.06	7.15	3.95	22.68	30
North West *	363	238	3.22	2.95	3.74	2.29	12.20	
Severn Trent	331	258	4.33	5.02	5.42	3.13	17.90	50
Southern ++	452	512	4.06	8.51	11.12	6.53	30.22	47
Southwest	406	343	6.13	5.45	8.73	7.41	27.72	36
Thames +++	442	331	3.24	3.79	5.91	7.46	20.40	30
Welsh	500	350	3.35	3.16	8.26	4.53	19.30	0
Wessex	351	323	1.90	4.76	5.30	4.69	16.65	59
Yorkshire **	927	316	-	7.40	8.08	4.46	19.94	27.50

* North West charge to satisfactory sea outfalls is R + M where M = 3.12 p/m^3.

** Yorkshore minimum charge is £5 if no sampling needed.

\+ Anglian is based upon COD plus 4.5 times the total oxidized nitrogen after settlement.

++ Southern base their charges on foul flows.

+++ Thames has a system of standing charges.

Source: Water Authorities Association Waterfacts.

Note: p/m^3 is pence per m^3, £ is pound sterling.

If a discharger discharges above his Consent the surcharge is calculated according to the same formula. But discharge above Consent is only allowed temporarily and provided the capacity of the sewage works is adequate. Continuous discharge above Consent requires new Consent. There are no surcharges for toxics.

Prosecutions are costly procedures for water authorities. It is estimated that each prosecution costs the authorities approximately 3000 pounds sterling. Magistrates Courts only award approximately 120 pounds sterling as total prosecution costs e.g. for sampling/analysis, preparation of the case, legal representation and presentation of the case. The fines imposed are used for the benefit of the Court. Only advocates fees and cost of analysis are returned to water authorities. A private case has to be mounted by the water authority if it wishes to recover further costs. The inclination to prosecute has probably reduced because of reduction in manpower numbers. Prosecution is considered as last resort and more influenced by cost and availability of staff than strength/weaknesses of legislation or cost to industry.

Prosecutions are usually successful. Screening of potential prosecution cases by various officers of the Water Authority results in a very high level of successful prosecutions. Statutory samples (samples for prosecution purposes) are taken in the presence of a representative of the company on site. The sample is split into three parts and sealed with plastic seals. The representative of the company has to sign that he has received 1/3 of the sample. The other two portions of the sample are brought back to the laboratory - one is stored in a refrigerator and the other is analyzed.

A standard recording sheet is used and the sample goes through a special system for one-off samples.

On the recording sheet the analyst has to:

- acknowledge receipt of the sample;
- indicate all the steps taken in the analysis;
- sign the sheet and state his professional qualifications.

The discharger analyzes his sample, if he wishes, according to the same procedure used by the Water Authority.

The Water Authority only prosecutes if it is almost completely certain of successful prosecution. Successful prosecution tends to ensure compliance.

There is a national maximum of 2000 pounds sterling per violation of each consent condition, e.g. if three parameters are exceeded (pH, SS, COD), the maximum fine is 6000 pounds sterling. Guidance is usually given by the solicitors of the Water Authority to lay Magistrates as to the level of fine, although this should usually be done by the Clerk of the Court.

5.6 Monitoring

The desired frequency of sampling is influenced by the need to have effective control over discharges to the sewer and the need to obtain representative samples for prosecution purposes.

The desired frequency of sampling for control purposes will depend on the type of effluent, the receiving sewer and sewage works and the reliability of the industry to meet its Consent Conditions. The frequency of sampling of a particular industrial effluent for control purposes is based on the judgement and experience of the pollution control staff and depends on the resources available. Frequency can vary from daily to two per year. However, the frequency is mainly influenced by the accuracy required for prosecution. The NWC/CBI paper (NWC/TE/77/1) sets out the accuracies that can be expected for particular variability and frequency of sampling. No self-monitoring by industry is required. The Water Authority determines on a case-by-case basis the sampling frequency and monitoring requirements.

Samples are taken at a suitable point designated in the Consent, usually on-site. The sampling site is provided by the industry as required in the Consent.

Most samples are taken on-site from manholes or flumes or industrial effluent streams before domestic sewage joins the effluent stream. Off-site sampling only takes place if no further effluent can enter the sewer upstream of the sampling point.

For charging purposes, composite samples are taken over a 24 hour period (ideally flow-weighted) for high volume, high variable strength trade effluents. For small flows and control purposes spot samples are usually taken. It is permissible to use the average value of several spot samples for legal action if composite samples are not available.

The samples are analyzed using full OA/QC procedures in Water Authority laboratories.

5.7 Contacts Made in England

Contacts in England were coordinated by Dr. Tom Zabel of WRc. WRc acts as a research and consulting organization to all the Water Authorities in England. As a result they are very familiar with the organization and operation of sewer systems in England.

To round out their experience and update their knowledge relative to some of the specific questions in the questionnaire, the following contacts were made:

Dr. G. Mance
Mr. J. Wild
Mr. J. Roberts
Severn-Trent Water Authority

Mr. B.D. Atkinson
Mr. R. Furniss
Mr. B. Milford
Southwest Water Authority

Mr. R. Freestone
Yorkshire Water Authority

Mr. D. Palmer
Wessex Water Authority

6. MUNICIPAL SEWER USE CONTROL IN GERMANY

6.1 Administrative Structure in Germany

The Federal Republic of Germany is a federation consisting of eleven States (Lander) with their own legislation and administration. The power to legislate belongs to the States unless the Constitution (Grundgesetz) specifies that the legislation comes under the authority of the Federal Parliament (Bundestag) and the Federal Council (Bundesrat). The Federal Council is composed of members of the governments of the States and is a means by which the States participate in federal legislation. The Federal Council has the right to object to all laws made by the Federal Parliament. Laws affecting the basic principle of federation or matters which fall within the jurisdiction of the States require the consent of the Federal Council.

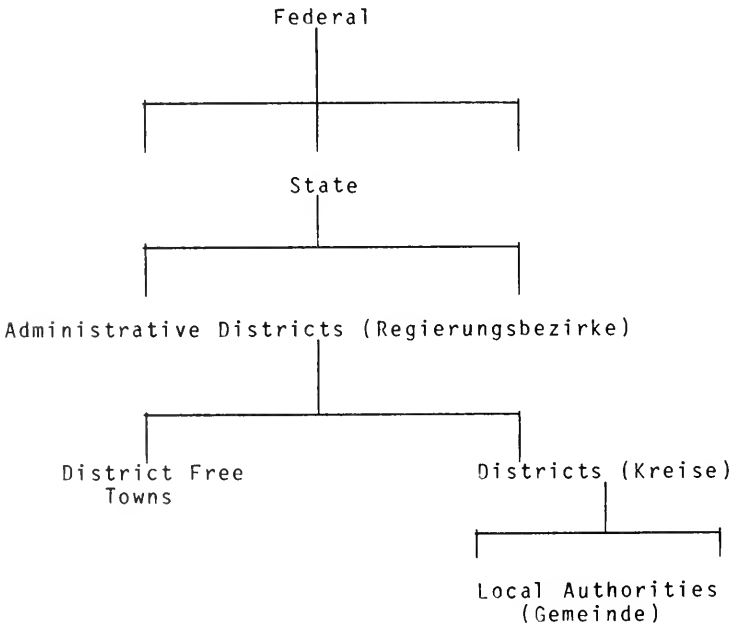
The Constitution also guarantees the right of the Local Authorities (Gemeinden) to self-government. The local authorities are the lowest tier of community authorities. The activities of the Local Authorities include both the functions that they perform in their own right (self-administrative responsibilities) and the functions delegated to them by the State administration. The responsibility of the local authorities relevant to environmental protection includes issuing building plans, construction and maintenance of local roads and communal functions such as sewage, sewage treatment works and abbatoirs.

Small local authorities are usually combined in a District (Kreis) which has also self-administrative rights according to the same legislation as for the local authority. The larger towns are usually district-free towns. A district is

a public body with a legal status that is responsible for activities that go beyond the areas of individual local authorities or exceed their financial or organizational capacity. The area of a district is that of the lowest state administrative district. The states are usually divided into several Administrative Districts (Regierungsbezirke) which constitute the intermediate (higher) states administrative level. The administrative structure in Germany is given in Table 6-1.

TABLE 6-1

ADMINISTRATIVE STRUCTURE IN GERMANY



6.2 Legislative Framework and Objectives

Water quality, except drinking water quality, is the responsibility of the States and therefore any legislation in this area passed by the Federal Parliament requires the consent of the States (Federal Council). The objective of the pollution control legislation is to minimize the impact of discharges on the environment. For the protection of the environment the Federal Parliament with the consent of the States has passed the following Framework Laws (Rahmengesetze):

1. The Water Management Law (Wasserhaushaltsgesetz) which legislates discharges to surface and ground waters. The 5th Amendment of the law was issued 30 September 1986.

2. The Waste Disposal Law (Abfallbeseitigungsgesetz) which legislates the disposal of solid and liquid wastes. This law was passed on 27 April 1986.

3. The Air Emission Law (TA Luft) which legislates emissions to the air. This law came into force on 1 March, 1986.

4. The Waste Water Charging Law (Abwasserabgabengesetz) which regulates the charges for discharges to surface waters. This law was passed 19 March 1987.

Implementation of the laws is the responsibility of the states and requires issuing of legislation by the states usually in the form of Law Regulations. Implementation of the laws is usually coordinated by LAWA (The Working Group of the Lander for Water and Waste) to achieve a uniform implementation of the laws in Germany.

In addition to the Framework Laws the Federal Government with the consent of the states can also pass various regulations which do not require implementing legislation of the states but require the consent of the states.

1. Full Regulations (Vollregelungen).

   a) Detergent Law (Waschmittelgesetz) which regulates the active ingredients used in detergents.

   b) Waste Oil Law (Altoilverordnung) which regulates the disposal of waste oil.

   c) The Chemical Law (Chemikaliengesetz) which legislates the introduction of new chemicals.

2. Federal Law Regulations (Rechtsverordnungen vom Bund). One such regulation relevant to sewer use control is the "definition of the different branches of industry producing waste water containing dangerous substances."

3. Federal Administrative Regulations (Verwaltungsvorschriften des Bundes).

   a) "Minimum Requirements for Waste Waters" originating from the different branches of industry defined in the Federal Law Regulations.

   b) Sewage Sludge to Agricultural Land Regulations (Klaerschlammverordnung).

6.3 Administrative Structure for the Control of Discharges within a State

The general administrative structure for the control of discharges to surface waters and sewers within a State is presented in Table 6-2.

TABLE 6-2

ADMINISTRATIVE STRUCTURE FOR THE CONTROL OF DISCHARGES WITHIN A STATE

Level	Administrative Branches	Responsibilities
1. Highest Authority (Oberste)	Ministry (Interior or Environment)	Legislation Highest Appeal
2. Higher Authority (Obere)	Regional Government (Regierungspresidien) (e.g. 5 in Nordrhein-Westfalia) (NRW)	Control of Direct Discharges Lower Appeal Advice
	Technical Authority (Landesamt fur Wasser Abwasser)	Advice to Ministry and Lowest Water Authority. Waste water charges in NRW
3. Lowest Authority (Untere)	Water Office (Wasserwirtschaftsamt) Technical Advice	Expert opinion of direct discharges Permission to discharge (State Office)
	Drainage Office (Entwaesserungsamt)	Legal enforcement of the control of indirect discharge Control of indirect discharges (Town District Office)
	Building Office (Bauamt) (Town or District Office)	

In smaller States the "Higher Authority" (the middle level) is sometimes dispensed with and in the Town States such as Hamburg there is only one level of administration.

Minor differences in structure can also be found between the different states. For instance in some of the larger towns in Nordrhein-Westfalia (NRW), such as Duesseldorf, the water office and the drainage department are both offices of the town whereas in Bavaria, e.g. Munich, they are completely separate institutions, one is an office of the Town, the other is a State office

In districts containing several small towns, the water office is at the district level whereas each municipality has its own drainage department. The drainage departments of the municipalities are responsible for the administration of the sewer use control regulations including the issuing of permits and control of indirect discharges, whereas, the water offices provide technical advice and have the control function for direct discharges. In towns where both the Lowest Water Authority and Drainage Department are offices of the town, the indirect discharges are controlled by the Lowest Water Authority and the direct discharges by the Higher Water Authority.

Any indirect discharger requires a permit from the municipality/district authority to discharge to the sewer. Permission is also required from the State since the discharge can influence the quality of the effluent from the sewage works discharged to a receiving water which is the responsibility of the State. Therefore an application for a permit has to pass to the district administration for the legal aspects and to the water offices for the technical aspects. However, provided that the limit values laid down

in the drainage regulations of the municipality are below the Minimum Requirements of the state, the state authority will generally have no objections to the permit.

6.4 Sewer Use Regulations

The control of discharges to sewers (indirect discharges) is currently being revised in Germany and is therefore, in a state of flux. In the past there were no national legal provisions for the control of indirect discharges and direct discharges required treatment only to the standard achieved by "generally achievable technology". Minimum requirements according to "generally achievable technology" have been published by the Federal Government with the agreement of the States for 45 different industries. The communes and town councils have passed their individual drainage regulations (Entwaesserungssatzungen) and have issued permits for the discharge to their sewers according to the values laid down in these regulations. Most municipalities followed in their regulations the guidelines proposed by the ATV (Abwassertechnischer Verein) for the control of indirect discharges in its working paper A115. This document provides guidelines for the setting of consents, gives information on the likely effect of discharges from various industries, lists effluents and materials which should not be discharged to the sewer system and provides guide values for selected toxic substances, Table 6-3. These guide values are concentration based and are not industry related.

Some municipalities such as Munich decided to set more stringent limit values to reduce the metal content in the sludge.

TABLE 6-3

GENERAL GUIDELINE VALUES CONSIDERED AS STILL BEING SAFE FOR SELECTED TOXIC COMPOUNDS - ATV WORKING PAPER A115

Temperature	35°C
pH Value	6.5 - 10
Settleable Solids	10 mL/L after 30 mins.
Saponifiable fats and oils	250 mg/L
Hydrocarbons (total)	20 mg/L
Organic solvents	5 mg/L
Arsenic (As)	1 mg/L
Lead (Pb)	2 mg/L
Cadmium (Cd)	0.5 mg/L
Chromium VI (Cr)	0.5 mg/L
Chromium (Cr)	3 mg/L
Nickel (Ni)	3 mg/L
Mercury (Hg)	0.05 mg/L
Selenium (Se)	1 mg/L
Zinc (Zn)	5 mg/L
Tin (Sn)	5 mg/L
Cobalt (Co)	5 mg/L
Silver (Ag)	2 mg/L
Ammonia (NH_4, NH_3)	200 mg/L
Cyanide Easily Removable (CN)	1 mg/L
Cyanide Total (CN)	20 mg/L
Fluoride (F)	60 mg/L
Nitrite (NO_2)	20 mg/L
Sulphate (SO_4)	600 mg/L
Sulphide (S)	2 mg/L
Phenol (C_6H_5OH) - Recoverable by distillation	100 mg/L

On 30 September 1986 the 5th Amendment of the German Water Management Law (Wasserhaushaltsgesetz) was published which in 7a states that direct discharges should be at least treated by means of "generally achievable technology" before discharge to surface water. However, if waste waters from certain industries contain substances, which because of their toxicity, persistence, bioaccumulation, carcinogenicity, mutagenicity or teratogenicity can be considered as dangerous substances, these waste waters must be treated by "best available technology" prior to discharge to surface waters. The same paragraph also states that the state has to ensure that discharges to the public sewerage system containing dangerous substances are controlled to the same standard as direct discharges.

In order to comply with the revised Water Management Law, the Federal Government in cooperation with the states is currently defining those branches of industries which discharge dangerous substances in their effluents which will be published as Federal Law Regulations. Subsequently the Federal Government with the agreement of the states has to issue limit values for each of these industrial branches which can be achieved by applying "best available technology". These limits values for the direct discharges will be derived by working groups made up of representatives from the Federal and State Governments and will be published as Federal Administrative Regulations for each industry. Only when these limit values are available can the states become active and set corresponding limit values for the indirect discharges. Whereas industry was directly involved in the derivation of the minimum requirements for direct discharges according to "generally achievable technology", industry is excluded from the derivation of "best available technology". It is claimed that the authorities have

sufficient experience to derive "best available technology" from their involvement in controlling existing discharges and their detailed knowledge of available pretreatment processes. Excluding industry will ensure that the limit values will not be "too soft" because of pressure from industry. However, industry will be able to comment on the proposals for "limit values" before final publication. It is claimed that at this late stage it is unlikely that industry will be able to "soften" the limit values because of strong political pressure.

Because of the time delay before the legislation for indirect discharges can be prepared, the states through the Working Group of the States for Water and Waste Water (LAWA) have published interim legislation for the control of discharges to sewers. These regulations provide a listing of the different industrial branches which contain dangerous substances and of the parameters which need to be controlled in the effluents of these different industrial branches. The regulations also give threshold values both in terms of concentration and load which both must be exceeded for the discharge to require authorization, Table 6-4.

Limit values for the different effluents are currently being derived by the states. For instance, Bavaria has derived interim values for the metal fabricating industry based on "best available technology" in Table 6-5.

TABLE 6-4

THRESHOLD VALUES WHICH BOTH MUST BE EXCEEDED BEFORE A DISCHARGE REQUIRES AUTHORIZATION

Substances or Group	Threshold Concentration mg/L	Load* g/h
Arsenic (total)	0.05	1
Lead (total)	0.2	8
Cadmium (total)	0.02	0.4
Chromium (total)	0.2	8
Copper (total)	0.3	12
Nickel (total)	0.2	6
Mercury (total)	0.005	0.1
Adsorbable Organic Halogens (AOX)	0.5	10
1,1,1-trichloroethane) trichloroethylene) trichloromethane) tetrachloroethylene)	0.2 each compound	4 (each compound
free chlorine	0.2	4

* g/h = grams/hour

TABLE 6-5

PROPOSED BAVARIA EMISSION VALUES BASED ON BEST AVAILABLE TECHNOLOGY FOR THE METAL FABRICATION INDUSTRY

	Minimum Requirements (Generally Achievable Technology) Values Depend on Type of Activity mg/L	Proposed Bavarian Emission Values (Best Available Technology) mg/L
Arsenic, Total	-	0.1 (only for ladder manufacturing)
Lead, Total	0.3 - 2	0.5
Cadmium, Total	0.1 - 0.5	0.2 (0.1 for garages and heat zinc treatment)
Chromium, Total	0.5 - 2	0.5
Copper, Total	0.3 - 2	0.5
Nickel, Total	0.3 - 2	0.5
Mercury, Total	0.005-0.05	0.05 (only permissible for battery manufacturing)
Total Chlorine	0.5 (active chlorine)	0.5
Adsorbable Organically Halogens (AOX)	-	1.0
1,1,1-trichlorethane trichloroethylene tetrachloroethylene trichloromethane		1.0 sum of compounds calculated as Cl

These limit values will have to be met in future by the dischargers although the municipalities can set more stringent values if a certain sludge quality or sewage effluent quality is required. The regulations also contain a questionnaire requesting details of the activity of the discharger and on the discharge itself to allow the water authority to decide whether the discharge requires authorization. In the questionnaire the discharger has to produce concentration data and estimates of the discharge volume and of the load of the various dangerous compounds discharged to the sewerage system.

These interim limit values will be superseded by the emission standards currently being derived for direct discharges based on "best available technology" once they are incorporated in the state regulations for the control of indirect discharges.

Some of the municipalities are at present also revising their own limit values in their drainage regulations to take into account the country's mood to tighten up the control of dangerous substances discharged to the environment.

An additional incentive for the municipalities to tighten up the control of indirect discharges is the Waste Water Discharge Law (Abwasserabgabengesetz) issued 15 March 1987. This law lays down charges for direct dischargers which include sewage treatment plants. The charges are based on COD and toxicity to fish but will include in the future also charges for certain dangerous substances such as heavy metals. Charges are halved if the waters are treated according to "generally achievable technology" e.g. if all parameters are below the "Minimum Requirements". If the discharger applies "best available technology" he only has to

pay 20% of the water discharge charges. Thus, if all indirect dischargers achieve the "Minimum Requirements", charges for the sewage effluent will be correspondingly decreased. The States use the income from the discharges to cover the cost of the control of the discharges and provide loans for the construction of treatment facilities. The municipalities pass-on the charges from the sewage effluent to the dischargers.

At present the sewer use programme in Germany is not based on a pretreatment programme, however the limit values tend to be so low for most industry that some pretreatment prior to discharge to the sewerage system is required to meet the limit values. The Federal Administrative Regulations for the "Minimum Requirements for Waste Water" originating from the different branches of industry outline pretreatment processes which achieve the limit values laid down. Similarly, once "Best Available Technology" has been derived it will provide pretreatment processes which can achieve the limit values.

For EC List 1 compounds the emission values given in the EC Directive are used as Minimum Requirements. These values are generally based on "best technical means" and are related to the pretreatment process before dilution. EC limit values are usually given as both concentrations and loads tied to manufacturing output.

Using the indirect discharge regulations only those compounds mentioned in the regulations can be controlled. However, using the direct discharge regulations, the municipality can be forced by the Water Authority to limit other compounds which must be incorporated into the discharge permit. The direct discharge regulations can require a permit for the discharge of any substance and as sewage effluents are covered by these regulations, it provides also the power for the control of all substances discharged to sewers.

6.5 Monitoring

Monitoring of effluents discharged to sewers is generally carried out only between 1 to 4 times per year depending on the size and importance of the discharge and how well the discharge is within the limits laid down.

In Munich which has probably the most strict sewer use control programme two samples per year are generally taken. Electroplating factories are sampled six to eight times per year and one factory which is the most important in terms of load discharged, is sampled daily although only five samples per month are analyzed. This sampling programme was established after an initial intensive sampling programme used to identify the quality of the discharges. It was claimed that strict control of the discharges was more important that the individual limit values set as treatment plants tend to operate usually well below the limit values and exceedence in quality is usually attributable to bad operation of the plant. It was also claimed that significant reduction in pollution load was achieved by better housekeeping within the plant which resulted in little or no extra cost for the factory.

It is important to treat partial streams before dilution for best effluent quality. Some plants have up to 80 pretreatment monitoring points each with its own permit.

6.6 Acceptability of Sewer Use Control

In Germany environmental protection is, after maintaining peace, the second most important political issue. The Green Party which has environmental protection as its main political aim received 8% of the votes in the last Federal

election and in some of the States it achieved in excess of 10%. The strong showing of the Green Party has resulted in a significant "greening" of the other parties to forestall a further increase in the strength of the Green Party. The effect of this "greening" can be seen by the extensive environmental legislation which has been passed in Germany in 1986/1987 with all the major laws being amended.

Environmental matters also receive great attention by the media - television, radio and press. Because of this pressure industry tends to accept the demands made on it in terms of cleaning up its effluent. This pressure has led to changes in manufacturing processes and a few plant closures.

There is little incentive to move to another location, firstly because demands on new plants are usually more strict than those for existing plants and secondly, due to the fact that similar regulations will be introduced in those parts of Germany where they do not exist at present. Even the relatively large additional monitoring costs which industry has to pay in Munich have not led to an exodus of industry. It is difficult to judge whether this is because industry tends to be richer in Munich than in other parts of Germany such as Dusseldorf, where recovery of the monitoring cost has not yet been contemplated. It has been claimed several times that effluent disposal costs are relatively small compared to the overall manufacturing costs and that improved effluent control can lead to a net cost saving due to product recovery and reduced water charges.

Large companies tend to be more responsive to new regulations because they fear bad publicity which could lead to loss in sales. Some companies even use their concern for the

environment for advertising purposes. Smaller companies are more difficult to control, often because of lack of expertise and awareness within the company.

6.7 Contacts Made in Germany

Contacts in Germany were made in two States (Lander) and at the local level and the state level of authority. The two states were Nordrhein-Westfalia and Bavaria. These two states represent the more complex form of state government in the administration of water matters. These states have the hierarchy:

Highest Authority (Oberste)
Higher Authority (Obere)
Lowest Authority (Untere)

where the Higher Authority is like our regional government and has in its structure the State Agency for water and waste. District-free or town states omit this level of government.

In Bavaria contacts were made at the highest level and the lowest level. At the highest level the contacts were:

Messrs. Schroder and Klec
Oberste Baubehorde im Bayerischem Staatministerium des Innern
Karl-Scharnagle Ring 60 Munchen

At the Lowest Level in Bavaria, the contacts were:

Mr. Eichinger - Chief Civil Engineer
Industrial Discharges
Mrs. Schuster - Head of Laboratory
Baureferat - Entwasserung
Herzog-Wilhelm - Str 15
8000 Munchen

In Nordrhein-Westfalia, the contacts were made at the intermediate level (Higher Authority) and at the local level. At the intermediate level the statewide agency for water and waste exists; contact was:

Mr. Gerhard Friesecke
Department Head, Wastewater and Waste
Landesamt fur Wasser und Abfall
(State Agency for Water and Waste)
Auf dem Draap 25
0-4000 Duesseldorf

At the lowest authority, contact was:

Mr. Rautenberg
Deputy Head-Lowest Water Authority, Duesseldorf
Untere Wasserbehorde - Zimmer 710
Postfach 1120, Auf den Hennekamp 45
D4000 Duesseldorf

7. MUNICIPAL SEWER USE CONTROL IN FRANCE

7.1 Administrative Structure in France

The present constitution of the Fifth French Republic was founded in 1958 at the time of De Gaulle's presidency. The State is headed by an elected president who has certain very important powers such as the right of dissolution of Parliament, recourse to referendum and the use of exceptional powers in times of crisis. The president also has free choice of prime minister. Legislative power rests with Parliament which consists of two chambers - the National Assembly and the Senate. The National Assembly is particularly important since its elected 'Deputés' are responsible for the voting and passing of major national laws. The Government has the inherited responsibility of implementing the laws by means of decrees.

The Republic is divided into 96 'Départéments' (departments). Each Department has a double administrative function. It manages departmental affairs with its own budget, with decisions being taken by the elected 'Conseil General'. In addition, the Department is a subdivision of central government. The law on decentralization in 1981 has to some extent separated central from departmental government. The Prefect (now renamed 'Commissaire de la République') now only functions as the executive of the state and is occupied exclusively with central government affairs at the level of the Department. Within the Departments are the 'Communes' which can vary considerably in size and which have a locally elected 'Maire'. Some responsibilities have been transferred to the Maires and some previously national functions have been given to the Conseils Generaux. There are also 'Régions' formed by grouping Departments together with powers to administer themselves although these powers are limited. The administrative structure is outlined in Table 7-1.

TABLE 7-1

ADMINISTRATIVE STRUCTURE IN FRANCE

Administrative Body	Head
Parliament - National Assembly - Senate	President of the Republic
Government	Prime Minister
22 Regions	Regional Commissioners of the Republic
96 Departments - Prefecture	Prefect or Departmental Commissioner of the Republic
- Conseil General	President of the Conseil General
Communes	Maire

7.2 Legislative Framework and Objectives

The principal law controlling industrial discharges to sewer is the Act No. 76-663 of 19 July 1976 on 'Installations registered for the purposes of environmental protection' (known as 'Installations Classés').

The objective of this Act is to provide a basis for the control of industrial activities which may be a public nuisance or threaten or endanger neighbourhood amenities,

public health, safety or sanitation, agriculture, nature and the environment, and buildings and monuments. The provisions of the Act apply to factories, workshops, depots, buildings and other sites, quarries and any other installations which might threaten or endanger the above listed categories.

The Act requires that all such premises are subject to either 'declaration' or 'authorization' by the Prefect of the Department. An official register exists listing for all industrial activities whether they are subject to declaration or authorization. 'Declaration' means that any industry wishing to locate in an area must first give written notification of its intention to the Departmental Prefect along with precise details of the intended activity. The Prefect then usually imposes a standard set of regulations according to the type of industry. These regulations usually include limit values for discharges.

For industries requiring 'authorization' the procedure is considerably more complicated. The precise details are laid out in the Government Decree No. 77-1133 of 21 September 1977 which implements the Act of 1976. The proprietor of the new plant must prepare a report giving all details of intended activities including a study on the impact on the environment. Notification of the application for authorization must be announced at the local municipal offices and in regional newspapers. The application is subject to a public enquiry lasting one month during which the voices of all interested parties may be heard. The technical report is also examined by a group of experts called the 'Conseil d'Hygiene' before the Prefect of the Department grants an authorization. In the case of industries discharging to sewers, exact requirements on the necessary pretreatment of the effluent will be outlined in the authorization along with limit values for the relevant parameters in the final effluent.

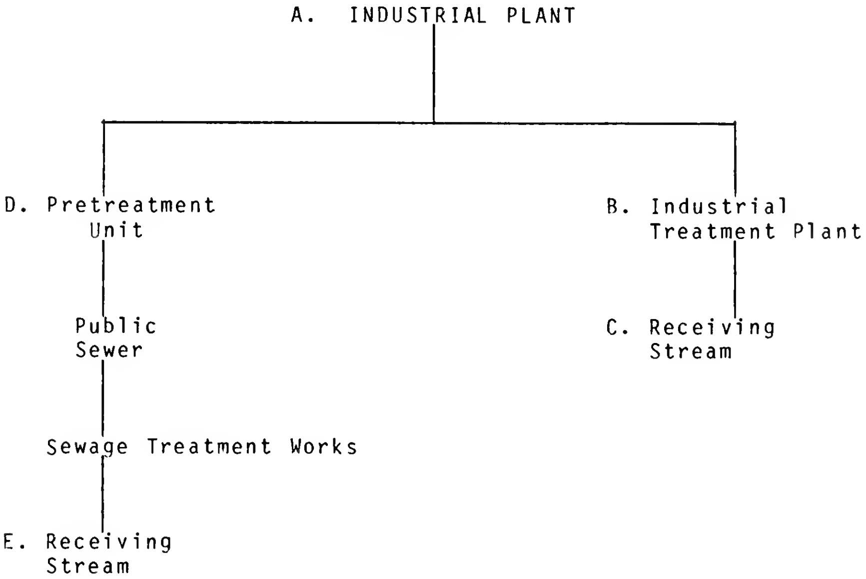
Detailed technical instructions for each type of industrial activity are issued in government 'arrêtés' and 'circulaires' and these include relevant criteria for discharges. These instructions are applied in setting out the requirements of the 'authorisation' by the 'Direction Régionale de l'Industrie et de la Recherche' (DRIR). This is the departmental body responsible for both the implementation and the enforcement of the 1976 Act.

It should be pointed out that the 1976 Act does not apply exclusively to industrial discharges to sewers. The Act covers all types of emissions to land, water and the atmosphere.

The main law controlling discharges to the aquatic environment is Act No. 64-1245 of 16 December 1964 on the administration, distribution and pollution control of waters. Under this law all discharges to the aquatic environment liable to result in pollution have to be authorized by the Prefect of the Department. Until the government Decree of 16 April 1987 relating to the Act of 1964, industrial premises registered as 'Installations Classés' which discharged directly into the aquatic environment were subject to authorization under both the Act of 1976 and the Act of 1964. The Decree of April 1987, however, effectively exempted 'Installations Classes' from requiring authorization under the Act of 1964.

The provisions of this new Decree are likely to considerably simplify the application procedure for new industries. The relationship between the two Acts is illustrated in Table 7-2.

TABLE 7-2
RELATIONSHIP BETWEEN THE 1976 ACT FOR 'INSTALLATIONS CLASSÉS' AND THE 1964 WATER ACT



Key:

A. Industrial activities controlled under the 1976 Act.

B. Effluent treatment and final effluent quality controlled under the 1976 Act.

C. Discharge to receiving waters controlled under the 1976 and 1964 Acts.

D. Discharge of effluent to sewer controlled under the 1976 Act (effluent limits and method of pretreatment).

E. Discharge from sewage treatment works to receiving waters controlled under the 1964 Act. (STWs are not registered as 'Installations Classés'.)

Other, older, legislation is still applicable to sewer use in France. The government issued a circular on 6 June 1953 giving general requirements for industrial effluent discharges to sewer systems connected to a treatment plant. Parameters and limit values included are:

pH	5.5 - 8.5 (9.5 if neutralization is with lime)
Max Temperature	30°C
Suspended Solids	1 g/L maximum
BOD (5-day)	500 mg/L maximum
Kjeldahl Nitrogen	150 mg/L as N
	200 mg/L as NH_4

The circular also states that the following are not permitted:

- Substances likely to result in undesirable smells, tastes or colouration in receiving waters.

- Substances likely to release toxic or inflammable gases or vapours.

- Floating material or any substances likely to damage the sewer system.

This circular was intended to provide guidelines for the departmental and municipal authorities and compliance is not mandatory. The provisions in the circular have, however, been adopted in local regulations of the owners and managers of municipal sewer systems.

The 'Code de la Santé Publique' (Public Health Code) is the national legislation applicable to public health matters and certain sections are applicable to sewer use. Articles L33

to L35.9 were created by the 'Ordonnance No. 58-1004 of 23 October 1958 after a polio epidemic in France. These articles provided the legal basis for the connection of both domestic and industrial premises to the public sewer. Article L35.8 requires that all non-domestic discharges must be authorized by the owner of the sewer network and the authorization must state the required quality of the effluent. The owner of the premises is liable to pay any costs incurred in installing, maintaining and running the sewer system resulting from the connection of the premises to the system.

The 'Ministère de la Santé' issued a circular on 10 June 1976 on the treatment of wastewaters and the protection of the environment. The circular gives technical instructions on the different types of sewer systems and treatment processes and gives details of the requirements for discharge of effluents to the environment, including limit values for each type of treatment process. It also requires operators of sewers and treatment works to keep a log book recording the functioning of the systems which may be inspected by state sanitation inspectors.

7.3 Administrative Structure for the Control of Discharges

Water pollution control in France is the combined responsibility of a number of different ministries, e.g. Environment, Health, Interior, Industry and Research, Sea, and Agriculture. Their various interests are represented in various interministerial committees which have the function of providing an integrated approach to forming national policy and legislation.

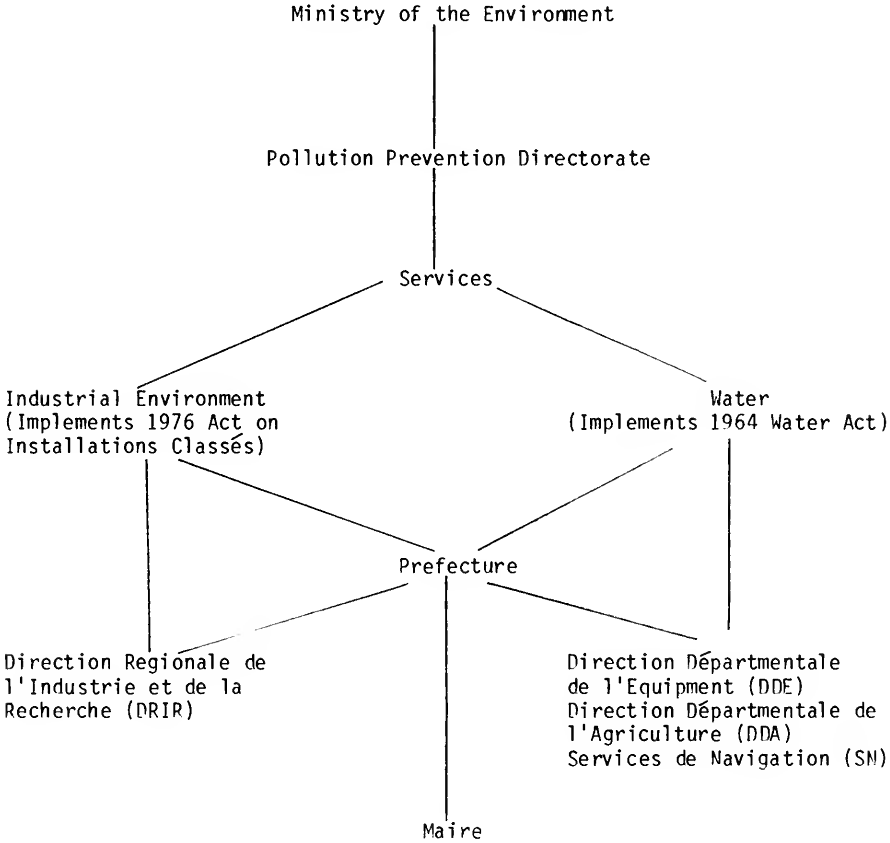
The Ministry of the Environment is especially important in that it is responsible for the implementation of the 1964 Water Act and the 1976 Act on 'Installation Classes'. The 'Direction de la Prevention des Pollutions', within this Ministry, has three services - Industrial Environment, Water and Waste. The Industrial Environment Service is responsible for drawing up and issuing Decrees, Arrêtés and Circulaires giving instructions for the implementation of the 1976 Act on 'Installations Classés'. The Water Service has a similar role in applying the Water Law of 1964. The Ministry of Health also has a very important responsibility in water pollution control as it oversees public health aspects and applies the Public Health Code.

At departmental level, a range of different departmental organizations exist which apply national legislation under the authority of the Prefect. The DRIR apply and enforce the 1976 Act controlling pollution from Installations Classes. Several departmental organizations may be responsible for the application of the 1964 Act, controlling water pollution, depending on the type of river. Large rivers may be covered by a Service de Navigation such as those of the Saone and the Seine. Other rivers are usually covered by either the 'Direction Départementale de l'Equipment' (DDE) or the 'Direction Départementale de l'Agriculture' (DDA). Public health legislation is applied by the 'Direction des Affaires Sanitaires et Sociales' (DASS).

At the municipal level, the Maire is usually responsible for the operation of the sewer system and treatment plants although this may be the combined responsibility of a collection of different communes in larger towns and cities. The Maire not only applies national legislation on a local

scale but also issues local by-laws which may serve an important role in the control of water pollution. The administrative structure for the control of discharges is summarized in Table 7-3.

TABLE 7-3
ADMINISTRATIVE STRUCTURE FOR THE CONTROL OF DISCHARGES



7.4 Sewer Use Regulations

Industrial discharges to municipal sewers are generally subject to control at both the departmental and the local level. For 'Installations Classés' the required quality of the effluent is laid down in the authorization to discharge issued by the Prefect of the Department. Effluent criteria are usually based on guidelines issued by the Industrial Environment Service of the Ministry of the Environment for each industry. The general principle is to apply 'best available technology which is economically acceptable'. Thus, there is a certain amount of flexibility in adopting the national guidelines to suit local circumstances.

The organization responsible for proposing the effluent limit values for each industry in the Department is the DRIR. Recommendations are put before a panel of expert scientists, engineers, doctors and administrators before the authorization is finally passed and issued by the Prefect. The DRIR is also charged with the enforcement of the regulations controlling 'Installations Classés' and has considerable legal powers to do so. The DRIR therefore plays a very important role in the control of industrial discharges to sewers although the extent to which this control is exercised seems to vary from region to region.

Sewer use is also controlled on a local scale by each commune represented by the elected Maire or, in the case of large towns or cities, by various inter-communal syndicates. For example, Lyon's sewers and sewage treatment plants are owned and operated by the 'Communauté Urbaine de Lyon' (COURLY) representing 66 different communes in the 'conurbation'.

The extent to which the municipal sewerage authorities can control sewer use depends largely on provisions made in local by-laws. One frequent complaint in France is that sewer use is often a low priority issue and the powers endowed to the sewerage authorities are inadequate for effective control. In the case of industrial discharges they are therefore dependent on the departmental authorities to enforce higher legislation.

Where local sewer use control regulations exist they usually take the form of a contract between the industry and the sewerage authority, called a 'convention de déversement'. This contract usually states that the effluent quality should meet the requirements laid down in the government circulars of 6 June 1953 and 10 June 1976 which include limit values for pH, temperature, suspended solids, BOD and nitrogen. Where specific toxics such as metal and organics are involved, the contract usually requires that the levels in the effluent do not exceed those laid down in the authorization granted by the Prefect.

There are cases such as the city of Rouen, for example, where no local regulations currently exist to control industrial discharges to municipal sewers. Nearly all the established industries discharge either directly to receiving waters or to sewers built and used exclusively by the industries themselves. The syndicate which owns the main sewer system and treatment works, however, the 'Syndicat Intercommunale de l'Assainissement de l'Agglomeration Rouenaise' (SIAAR) is currently developing its own sewer use regulations since there is mounting pressure for certain industrial effluents to be treated at the municipal treatment works.

SIAAR's proposed regulations are presented here as an example of a city developing its own strategy for sewer use control. It should be emphasized that they are currently under discussion and should be considered as tentative at present. Minimum requirements for gross parameters in industrial effluents are:

pH	5.5-8.5 (or in exceptional cases 9.5)
Temperature	<30°C
Suspended Solids	<500 mg/L
COD	<750 mg/L
COD/BOD_5	<2.5
Total Nitrogen	<150 mg/L
Ammoniacal Nitrogen	<200 mg/L

- Effluent must not contain floating material liable to block up sewers or produce noxious gases.

- Effluent must not contain substances capable of destroying bacteria in biological treatment processes or killing aquatic life in receiving waters.

The regulations also stipulate pretreatment for industrial effluents containing:

- Strong alkalis
- Certain salts (particularly chromates and dichromates)
- Certain poisons (notably cyanides)
- Hydrocarbons, oils and greases
- Noxious gases and substances which become explosive on mixing with air
- Substances producing nauseous odours
- Radioactive waters

In addition to the above, limit values are also given for the following substances. The values are expressed as concentrations which should at no time be exceeded.

Fe	1 mg/L
$Mg(OH)_2$	300 mg/L
SO_4^{2-}	400 mg/L
Cu	1 mg/L
Co	2 mg/L
Hg	0.1 mg/L
Ag	0.1 mg/L
S^{2-}	1 mg/L
F	10 mg/L
Cl_2	3 mg/L
NO_2^-	10 mg/L
Sn	0.1 mg/L
Al	10 mg/L
Cd	3 mg/L
Cr	2 mg/L (trivalent)
Cr	0.1 mg/L (hexavalent)
Zn	15 mg/L
Ni	2 mg/L
Pb	0.1 mg/L
CrO_3^{3-}	2 mg/L
CN^-	0.5 mg/L
As	1 mg/L
Phenol	5 mg/L

Total metals 15 mg/L

Finally, the regulations contain a list of substances which are strictly not permitted since they are likely to corrode or obstruct sewers or put the safety of maintenance staff at risk. The list contains the following:

- inflammable or toxic gases;
- hydrocarbons and halogenated derivatives; concentrated hydroxides;
- mud, sand, gravel, ash, cellulose, glues, tars, oils and greases;
- domestic rubbish;
- solid industrial waste;
- substances liable to abnormally colour waters;
- industrial wastewaters not conforming to the above-mentioned conditions;
- solids or liquids of animal origin, especially manure.

7.5 Monitoring

Monitoring of industrial effluents discharged to municipal sewers is usually carried out both by the DRIR and the operators of the sewer system. The DRIR undertake regulatory monitoring to check compliance with the requirements of the authorization to discharge for 'Installations Classés'. DRIR personnel have the legal right to enter industrial premises at any time and may take samples where they wish. These samples are analyzed at independent laboratories designated by the Ministry of the Environment using agreed protocols with analytical quality control. It is the industry that is obliged to meet the costs of the sampling and analysis. Frequency of sampling varies according to the size and type of industrial activity but the usual case for routine monitoring is three to four times per year. In cases of suspected non-compliance monitoring frequency may be increased. There have been examples where effluents have been sampled on a daily basis. Laboratory fees are expensive, so the high costs of increased sampling and analysis tend to encourage the industry to conform quickly with the regulations.

Monitoring is also carried out on a local scale by the operators of the sewer system and treatment works to verify whether or not local regulations are being respected by the industry. There is usually a small staff which takes samples at the point of discharge into the sewer and the samples are analyzed either at independent laboratories or, in the case of larger operators such as COURLY in Lyon, at their own laboratories. Frequency of sampling is on average three or four times per year for the significant industries although, again, this varies according to the industry. The costs of sampling and analysis are met either directly or indirectly through levies, or 'redevences', by the industries themselves. Theoretically, the operator of the sewer system has the right to refuse to accept the effluent from an industry if it fails to respect local regulations laid down in the contract or 'convention de déversement'. In practice, however, this rarely happens since the municipalities make efforts not to discourage valuable local industry.

7.6 Acceptability of Sewer Use Control

Since the organization of water pollution control following the passing of the 1964 Water Act, quality objectives have been established for most of France's rivers and pollution reduction programs have been initiated in many areas. The 1976 Act controlling pollution from 'Installation Classés' has also had considerable impact in certain industrialized areas. For example, in 1979 the River Seine was effectively deoxygenated from Rouen to its estuary at Honfleur, a distance of approximately 100 km. By 1985 this situation had changed dramatically and, apart from problems in the estuary stretch, dissolved oxygen levels had markedly increased.

There was a 70% reduction in the industrial pollution load (in terms of COD) between 1978 and 1985 with an associated cost of approximately 1,300 million Francs.

Examples such as this illustrate the effect of the legislation controlling industrial pollution and the considerable cost which has been borne by the industries themselves. Despite this the regulations appear to be widely accepted although, in some cases, not necessarily willingly. The overall impression is that, apart from a few cases, most industries make efforts to conform and will generally cooperate with the authorities although they complain readily about the associated costs.

There is some indication of regional differences in the level of enforcement of regulations. For example, the authorities in the lower Seine area tend to be quite strict in the control of industrial discharges. There is, however, no evidence that this has been responsible for any migration of industry from one region to another. Although the cost to industry for pollution control may be high it appears to be generally tolerable and does not seem to act as a major disincentive.

7.7 Contacts Made in France

The control of industrial discharges in France is organized within a complex multi-level framework involving national, regional, departmental and communal authorities. As a result the groups assembled to discuss regulation making, enforcement and implementation were selected to encompass the various levels of responsibility.

The group assembled to discuss the regulation and enforcement were as follows:

M Lalanne
Service Environment
Industrial
Ministère de l'Environnement
Boulevard du General
Leclerc
92524 Neuilly-sur-Seine

M Dumont
Division Environnement
Direction Régionale de
l'Industrie et de la
Recherche
21 Avenue de la Portes de
Champs
76037 Rouen

Mme Lemercier
Service Environnement
Prefécture de la Seine-
Maritime
Cours Clemençeau
76033 Rouen

Mme Besançon
Bureau Environnment
Préfecture du Rhône
69419 Lyon

This group provided an overview of the French system of sewer use control as viewed from the national, regional and departmental perspective.

In addition two local level contacts were made, one in Rouen northwest of Paris and the other in Lyon in the south central part of the country at the confluence of the Rhône and Saône Rivers. At Lyon, the meeting was held with the local sewer authority representative in the company of representatives of regional and departmental authority organizations. The following people were interviewed at Lyon.

Mme Moissonnier	- DASS	- Direction des Affaires Sanitaires et Sociales
M Colomer	- COURLY	- Communauté Urbaine de Lyon
M Solente	- Service de la Navigation	
M Champney	- DDA	- Direction Départementale de l'Agriculture
M Bouillot	- DRIR	- Direction Régionale de l'Industrie et de la Recherche

Within this group the representative of COURLY is responsible for the operation of the sewer system although he has little power of enforcement of regulations.

At Rouen, the following people were interviewed.

M. Tazé
Directeur de Service Technique
SIARR (Syndicat Intercommunal d'Assainissement de l'Agglomeration Rouennaise)
Rouen

M. Herbert
Service Assainissement
Ville de Rouen
3 rue Géricault
7600 Rouen

M. Loths
Direction Départmentals de l'Equipment
25 Boulevard des Belges
76000 Rouen

M. Brichard
Delegué Régionale
Agence de Bassin Seine-Normandie
21 rue de Crosne
76000 Rouen

Of this group, it is the SIARR who are principally responsible for overseeing sewer use although they have no legal powers to enforce regulations.

8. MUNICIPAL SEWER USE CONTROL IN JAPAN

8.1 Legislative Framework and Objectives

Japan is organized with a strong national government that retains the responsibility for the enactment of legislation in the area of water quality and the establishment of standards for industrial discharge. Japan is divided into Provinces whose responsibility is the implementation of programs that will meet the objectives of the pollution control laws and the standards established thereunder.

Historically, Japan first established pollution control legislation in 1967. The Basic Law for Environmental Pollution Control is an omnibus piece of legislation covering air, water, noise, soil, etc. It remains in force and has been strengthened by the passage of supporting legislation like:

- Air Pollution Control Law
- Waste Disposal and Public Cleansing Law
- Water Pollution Control Law

Figure 8-1 details the organization of legal system for water quality management. Similar laws and administrative organizations are in place for other environmental compartments, e.g. for air pollution and for solid waste management. As indicated in Figure 8-1, air and solid waste laws are also applicable to water quality management so that intermedia pollutant transfers to air (through volatilization) and sludge are covered.

Environmental regulation in Japan falls under the Ministry of Health and Welfare. The Japanese divide responsibility for programs on water quality on the basis of the receptor in the environment. The national government maintains responsi-

FIGURE 8-1

JAPANESE LEGAL SYSTEM FOR WATER QUALITY MANAGEMENT

Basic Law for Environmental Pollution Control

Environmental Pollution Control Program: to be established by Provincial Governments

Water Quality Standards Established by National Government

Standards for the Protection of Human Health:	Standards for the Conservation of Living Environment:
applied equally to all public water areas in the country	application for the categories of standards is decided at discretion of: National Government for inter-provincial water bodies Provincial Government for water bodies in the Province

Source Control Laws

- Water Pollution Control Law (control of effluent)
- Laws concerning Special Measures for Conservation of Lake Water Quality
- Laws concerning Special Measures for Conservation of Seto Inland Sea
- Marine Pollution Prevention Law (control of oils and wastewater dumping)
- Sewage Law
- Air Pollution Control Law
- Mine Safety Law
- Coal Washing Law
- River Law
- Port Regulation Law
- Natural Park Law
- Fishery Resources Protection Law
- Waste Disposal and Public Cleaning Law
- Poisonous and Deleterious Substances Control Law
- Agricultural Chemicals Regulation Law

bility for all matters pertaining to human health. The provincial government is responsible for other living receptors in the environment. For interprovincial waters, the national government retails all responsibilities. While the prime motivation for much of Japanese law was the uncontrolled industrial discharge of waste that led to outbreaks of public health problems like Minimata disease there is a recognition that public works (sewage plants) were also responsible for environmental damage. This has been recognized in a national agreement that public works be subject to the same water pollution control laws.

There is a recognition in Japanese law of the impact of total loading on a receiving water body. Two features of their laws speak to this aspect. First, special legislation exists to protect the Seto Sea, an essentially landlocked marine environment that was being degraded by surrounding human activity. Another legal initiative is the Area-Wide Pollutant Load Control System that addresses the loading of lakes and river systems on a watershed basis.

8.2 Control Programs

At present, the Japanese are in a highly reactive phase of development environmental control programs. Their socio-economic structure has changed radically because of migration of a large rural population to the cities as a result of the attraction of the industrial society and mechanization of agriculture. The net result is that only 40% of the Japanese population is served by adequate sewage treatment. Even with large expenditures, progress has been slow in upgrading municipal sewage collection and treatment works. As a result municipal wastewater is considered to be a major cause of water pollution.

Present programs are addressing gross pollution control measures like:

- expansion and improvement of sewerage systems and sewage treatment facilities

- control of land use in the location of industry

- improvement of river flow including dredging

- removal of sludge and bottom sediments in water bodies

- environmental impact assessment of new projects.

Where gross pollution is coming under control, strict regulation of discharge is being implemented. The types of specific pollutants controlled are discussed below. In general, the types of programs are:

- source control of effluent discharge;

- national minimum effluent control standards supplemented by additional (local) standards where needed;

- area-wide control of chemical oxygen demand (COD) loading for semi-enclosed water bodies;

- waste treatment and disposal for solid and liquid industrial wastes;

- marine pollution and dumping control.

8.3 Control Authorities

As illustrated in Table 8-1, the national government maintains ultimate authority over water pollution control problems. The effluent discharge standards are developed nationally. The implementation and enforcement of the programs and standards falls to the provincial governments.

Provincial governments are authorized to order corrective action on municipal or industrial facilities and can order stoppage of an operation where warranted.

A Water Quality Council has been set up to study water quality issues for surface water and ground water. The Council advises the Minister of the Environment on these issues. Corresponding provincial water quality councils exist with a similar mandate on the provincial level.

8.4 Industries and Pollutants Controlled

Industries are not defined as such, rather Specified Facilities are defined which may be found in industry. Specified Facilities are defined as the facilities which discharge wastewater which contains toxic substances or fails to meet pollution indices. Toxic substances and pollution indices are defined below. About 90 kinds of factories or establishments are identified in Japan as those which contain Specified Facilities.

Toxic substances are identified as follows for discharge into water:

- cyanide
- alkyl mercury

- organic phosphorus including parathion, methyl parathion, methyl dimenton and EPN
- cadmium
- lead
- chromium
- arsenic
- total mercury
- PCBs

This is a relatively short list of toxics compared to European and North American initiatives. As a parallel, it is instructive to list hazardous and subhazardous substances for (solid) waste disposal as listed under their Waste Disposal Act, viz:

Hazardous

- mercury and its compounds
- cadmium and its compounds
- lead and its compounds
- organo phosphorus compounds
- hexavalent chrome compounds
- cyanide compounds
- PCB

Subhazardous

- organo chlorine compounds
- copper and its compounds
- zinc and its compounds
- fluoride

Pollution indices are established for the following parameters.

- pH
- chemical oxygen demand (COD)
- suspended solids (SS)
- dissolved oxygen (DO)
- number of coliform or total coliform
- nitrogen and phosphorus (for lakes)
- n-hexane extracts (for coastal waters)

8.5 Types of Standards

The standards are effluent water quality standards developed and applied consistently across the nation. The standards are referred to as pretreatment standards indicating treatment is to take place before discharge to the municipal sewer. However, there is apparently no difference in discharge limits among industrial sectors. Specified Facilities are identified in a categorical way but this appears more in an effort to identify industrial activities subject to control regulation rather than trying to differentiate among industry using permissible discharge limits. The toxics are targeted for protection of human health; the pollution indices are targeted for the "conservation of the living environment".

Table 8.2 lists the standards for toxics.

TABLE 8-2

WATER QUALITY STANDARDS RELATED TO THE PROTECTION OF HUMAN HEALTH

Item	Standard Values
Cyanide	Not detectable*
Alkyl Mercury	Not detectable*
Organic Phosphorus	Not detectable*
Cadmium	< 0.01 mg/L
Lead	< 0.1 mg/L
Chromium	< 0.05 mg/L
Arsenic	< 0.05 mg/L
Total Mercury	< 0.0005 mg/L
PCBs	Not detectable

* Not detectable by JIS K 0102 (Japanese Industrial Standard for testing and measurement of wastewater).

For the protection of the living environment, three classes of receiving water are defined as follows, together with subclassifications.

- Water Supply Class 1: Water that requires treatment by simple treatment such as filtration.

- Water Supply Class 2: Water that requires treatment by normal treatment such as sedimentation and filtration.

- Water Supply Class 3: Water that requires treatment by highly advanced treatment including pretreatment.

- Fishery Class 1: For aquatic life such as trout and bull trout inhabiting oligosaprobic water, and those of fishery Class 2 and 3.

- Fishery Class 2: For aquatic life, such as fish of the salmon family and sweet-fish inhabiting oligosaprobic water and those of fishery Class 3.

- Fishery Class 3: For aquatic life, such as carp and silver carp inhabiting betamesosaprobic water.

- Industrial Water Class 1: Water given normal treatment by chemicals.

- Industrial Water Class 2: Water given advanced treatment by chemicals.

- Industrial Water Class 3: Water given special treatment.

- Conservation of the environment: Up to the limits at which no unpleasantness is caused to people in their daily life (including a walk by the riverside, etc.).

These classes of receiving water are subject to discharge standards which are in the nature of so-called "pollution indices". They are specified for rivers, Table 8-3, lakes, Table 8-4 and coastal waters, Table 8-5.

TABLE 8-3

WATER QUALITY STANDARDS RELATED TO THE CONSERVATION OF LIVING ENVIRONMENT

		Standard Values				
Category	Purpose of Water Use	pH	BOD	SS	DO	Number of Coliform Group
AA	Water Supply Class 1 Conservation of Natural Environment. Uses listed in A-E	6.5 - 8.5	< 1 mg/L	< 25 mg/L	> 7.5 mg/L	50 MPN/100 mL or less
A	Water Supply Class 2 Fishery Class 1 Uses listed in B-E	6.5 - 8.5	< 2 mg/L	< 25 mg/L	> 7.5 mg/L	1,000 MPN/100 mL or less
B	Water Supply Class 3 Fishery Class 2 Uses listed in C-E	6.5 - 8.5	< 3 mg/L	< 25 mg/L	> 5 mg/L	5,000 MPN/100 mL or less
C	Fishery Class 3 Industrial Water C.1 Uses listed in D-E	6.5 - 8.5	< 5 mg/L	< 50 mg/L	> 5 mg/L	
D	Industrial Water C. 2 Uses listed in E	6.0 - 8.5	< 8 mg/L	< 100 mg/L	> 2 mg/L	
E	Industrial Water C. 3	6.0 - 8.5	<10 mg/L	-	> 2 mg/L	

TABLE 8-4

WATER QUALITY STANDARDS FOR LAKES/RESERVOIRS
(> 10 MILLION M^3)

Category	Purpose of Water Use	Standard Values: pH	COD	SS	DO	Number of Coliform Group
AA	Water Supply Class 1 Conservation of Natural Environment. Uses listed in A-E	6.5 - 8.5	< 1 mg/L	< 1 mg/L	> 7.5 mg/L	50 MPN/100 mL or less
A	Water Supply Class 2 Fishery Class 1 Uses listed in B-E	6.5 - 8.5	< 3 mg/L	< 5 mg/L	> 7.5 mg/L	1,800 MPN/100 mL or less
B	Water Supply Class 3 Fishery Class 2 Uses listed in C-E	6.5 - 8.5	< 5 mg/L	< 15 mg/L	> 5 mg/L	
C	Fishery Class 3 Industrial Water C.1 Uses listed in D-E	6.5 - 8.5	< 8 mg/L	*	> 5 mg/L	

* Floating matters such as garbage should not be observed.

TABLE 8-4

WATER QUALITY STANDARDS FOR LAKES/RESERVOIRS

(continued)

Nitrogen and Phosphorus for Lakes

Category	Purpose of Water Use	Standard Values: Total Nitrogen	Standard Values: Total Phosphorus
I	Conservation of Natural Environment. Uses listed in II-V	< 0.1 mg/L	< 0.005 mg/L
II	Water Supply Class 1, 2, 3 (incl. Special Types Fishery Type 1, Bathing. Uses listed in III-V	< 0.2 mg/L	< 0.01 mg/L
III	Water Supply Class 3 (Special Types), Uses listed in IV-V	< 0.04 mg/L	< 0.03 mg/L
IV	Fishery Type 2, Uses listed in V	< 0.6 mg/L	< 0.05 mg/L
V	Fishery Type 3, Industrial Water, Agricultural Water, Conservation of the Living Environment	< 1 mg/L	< 0.1 mg/L

Notes:
- The standards are measured in terms of annual averages.
- The standards for total nitrogen are applicable to lakes and reservoirs where nitrogen is judged to be causative factor of growth of photoplankton.
- The standards for total phosphorus are not applicable to agricultural water use.

WATER QUALITY STANDARDS FOR COASTAL WATERS

Category	Purpose of Water Use	Standard Values				
		pH	COD	DO	Number of Coliform Group	M-Hexane Extractss
A	Fishery Class 1 Bathing, Conservation of Natural Environment. Uses listed in B-C	7.8 - 8.3	< 2 mg/L	> 7.5 mg/L	1,000 MPN/100 mL or less	Not Detectable
B	Fishery Class 1 Industrial Water Uses. Listed in C	7.8 - 8.3	< 3 mg/L	> 5 mg/L		Not Detectable
C	Conservation of Natural Environment*	7.8 - 8.3	< 8 mg/L	> 2 mg/L		

Notes:

- The number of coliform group shall be less than 70 MPN/100 mL, even when the water quality is categorized as A.
- Fishery Class 1: For aquatic life such as red sea-bream, yellow tail, seaweed and those of Fishery Class 2.
- Fishery Class 2: For aquatic life such as gray mullet, laver, etc.

* Up to the limits at which no unpleasantness is caused to people in their daily life. (Including a walk by the shore, etc.).

8.6 Approvals and Permits

The approval to use a sewer system is based on the submission of a report detailing administration of the industry (owner, address, etc.) and technical aspects of the Specified Facilities (operation, volume, concentrations) for the proposed discharge to the sewer. The report is submitted to the local sewerage authority bureau (e.g. Metropolitan Tokyo) who accept it for the basis of a discharge connection. The bureau can require changes be made to the proposed system before connections. Provincial governments have an overlying authority to make corrections and/or stop discharges.

8.7 Record Keeping and Reporting

The Japanese consider that a better understanding of effluent water quality will help industries to improve waste water treatment. As a result the control regulations require that measurements of water quality be recorded and kept for five years. The data is to be submitted to the sewerage bureau as well. This bureau decides on reporting periods and frequency of sampling in consideration of the past history of the industry.

Any changes in the Specified Facilities with respect to operation, loading, etc. must be reported to the sewerage bureau for approval.

8.8 Inspection and Sampling

Inspectors from the sewerage bureau have the authority to enter, inspect and sample at industrial establishments. They

use the data obtained to either advise industries that improvements to treatment are needed or lay charges in the case of serious contraventions.

Sampling and analysis is carried out under the guidance of JIS (Japanese Industrial Standards) for Industrial Wastewater Testing. Analysis is carried out by the industrial labs or by certified third-party laboratories.

8.9 Enforcement

Violations detected by inspection and/or sewage sampling are prosecuted by the municipal sewerage bureau. Penalties include fines of up to ¥ 200,000 or six months imprisonment. Even accidental discharges create a legal liability of up to ¥100,000 or three months in prison. Control orders (in Japan "Orders of Rectitude") must be obeyed at the risk of ¥500,000 fine or a year in jail.

Cases of violations are said to be publicized in newspapers and those convicted of discharge offences are condemned socially. In cases of extreme violation, the matter is turned over to the police.

8.10 Acceptability of the Central System

In Japan the growth of sewer use controls has been different than elsewhere in the jurisdictions studied. The starting point, 20 years ago, was essentially a total lack of industrial discharge control to sewers and surface water. Gross pollution including clearly identified human impacts precipitated strong action through the 70's to correct the worst

situations. Respondents to this study's questionnaire said these actions are publically very strongly supported.

In the eighties there is an apparent sloving of the efforts. It was reported that only 40% of the population is served by sewers in a rapidly urbanizing society. Gross pollution has recently still existed and led to a law on Special Countermeasures for Lake Water Quality (1984). While it is said pollution abatement costs are treated favourably in the tax system and grants are made, some industries still claim special consideration because of the potential economic penalty. Statistics presented spoke well to the reduction in discharge violations but the number of violations is still high for a purportedly successful system. In 1986, over 20% of the samples analyzed in Tokyo were not in compliance, less than 90% of the factories were equipped with pretreatment facilities and yet only one control order was issued.

9. SELECTION OF SEWER USE CONTROL OPTIONS FOR DETAILED STUDY

9.1 Introduction

This section documents the process and the results of selecting a short-list of sewer use control options from the data in the foregoing sections. The review of sewer use control in other jurisdictions has identified specific examples of control options; individual features of these different control options can be combined to develop hybrid control options for consideration in Ontario according to a descriptive scheme given in Section 9.2. In order to ensure that options selected for further study are applicable in Ontario under the MISA initiative some control options were excluded from further study. The criteria for excluding these options are detailed and applied in Section 9.3.

Finally a selection is made from the specific control options and all possible hybrids suggested by combining the various specific features in every combination possible. This is the list of options selected for further stucy, Section 9.4.

9.2 Unique Features for Control Options: Pretreatment Standards and Industrial Effluent Quality Standards

Sewer-use control options can be described in a number of ways from the type of water quality standards embodied in the option through to the physical environment where the control is in force. Table 9-1 lists the features, together with the principal alternative ways of describing each feature. It also includes a judgement as to whether each feature is major or minor, relative to how it might be used to differentiate

TABLE 9-1

SEWER USE CONTROL FEATURES

	Feature	Major/ Minor	Proactive/ Reactive
1.	Effluent Discharge Basis - Pretreatment Standard - Industrial Effluent Quality Standard	Major	Proactive
2.	Regulation Setting Agency - Junior Level/Province - Federal/Senior Level	Major	Proactive
3.	Enforcement Agency - Local/Junior level - Province/State/Federal/Senior Level	Major	Proactive
4.	Fiscal Controls/Incentives - Incentive, Economic Development Vehicle - Punitive, Non-discretionary, business cost	Major	Proactive
5.	Legal System - Strict, Litigenuous - Compromising, flexible	Major (Minor)*	Proactive (Reactive)
6.	Monitoring Requirements - Frequent, long list - Compliance, site specific	Minor	Proactive
7.	Physical Facilities - Separated Sewers, Secondary treatment or better - Combined sewers, primary treatment or less	Minor	Reactive (Proactive)
8.	Industrial Base - Resource to primary - Secondary manufacturing to high tech.	Minor	Reactive
9.	Physical Environment - Fresh water lake/river - Estuarine/marine	Minor	Reactive

* Parenthesis indicates doubt or a matter of opinion.

between options. Also listed is a judgement as to the potential for a regulator to influence the type of control. Proactively, the regulator has certain factors over which control can be exercised. Reactively, the regulator can only react to the existing situation without changing it. For example, the regulator can decide whether or not financial incentives should become part of the regulation but the physical environment, in which industry exists cannot be changed in any meaningful way.

To be completely rigorous these nine features define 2^9 = 512 unique control options. By limiting the number of features used to characterize a control option, a manageable number of control options can be identified. There are five features that are of major importance to a control option and over which a regulator has a measure of control:

- effluent discharge basis
- regulation setting agency
- enforcement agency
- fiscal controls or incentives
- legal system

The use of two descriptive aspects of each feature not only simplifies the development of a short-list but also is rooted in some reality. The principal feature of any control option is the Effluent Discharge Basis. In all the jurisdictional areas studied, there were only two types of effluent discharge bases apparent, viz:

- Pretreatment Standards (PS) and
- Industrial Effluent Quality Standards (IEQS).

The discussion that follows is organized under these two types of effluent discharge regulations. In order that it

is explicitly understood what is meant by these standards the following definitions are provided.

> Pretreatment Standard defines a permissible concentration or mass emission of contaminant per unit of production specific to an industrial category and based on best available technology (economically achievable) (BATEA).
>
> Industrial Effluent Quality Standard defines a concentration and mass emission of a contaminant for industry in general.

All the other features chosen to describe the options are of major significance and could proactively be affected by the regulator. The monitoring requirement feature was another possible feature that could have been used to describe options since a regulator can definitely choose different monitoring requirements. However, this would most significantly affect implementation costs and was rejected because costs should not be a primary feature of the control option evaluation. This does not diminish in any way the weight that will be given this feature in the detailed evaluation.

The five major features and their contrasting characteristics an summarized as follows:

	CHARACTERISTICS OR DESCRIPTORS	
PRIME FEATURE:		
Effluent Discharge Basis	Pre-treatment Standard	Industrial Effluent Quality Standard
SUBSIDIARY FEATURES:		
Regulation Setting Agency	Junior Level (Province)	Senior Level
Enforcement Agency	Junior Level (Municipal)	Senior Level
Fiscal Controls/Incentives	Direct Cost	Cost Tied to Incentive
Legal System	Strict	Compromising

In this description, the "Junior Level" agency has different meanings for the Regulation Setter and the Enforcer. The most junior level of government that would set regulations is a province or state. On the other hand, the most junior level of government that would enforce regulations is the municipal government.

The description "Senior Level" should be read with the meaning "higher level". This recognizes that in some jurisdictions there could be three levels of government but in any circumstance, only two levels are involved in the setting and enforcing regulations. To avoid the confusion of introducing a third level, only a junior-senior differentiation is made.

9.3 Exclusion of Options

Among the control options studied, those existing in Canada, England and Japan have been excluded from further evaluation. The basis for their exclusion rests on the MISA exclusionary criteria described below. Documentation of the exclusion of Canadian, English and Japanese control options is provided in this section as well.

9.3.1 Exclusionary Criteria and Their Application

The evaluation of the sewer use control options has taken place on an initial screening level and then, under Phase II, will take place on a detailed level. The general approach to the detailed evaluation is given in Section 10. The screening evaluation is initially based on "exclusionary criteria"; that is, criteria for which failure to meet by a control

option means that the option would not ever be considered as a possible option for use in Ontario. The long list of control options can be considered to be all the possible options implied by the possible combinations of the control option features described in Section 9.2. Instead of applying the exclusionary criteria to that long-list, the specific control options identified by this study were evaluated against the exclusionary criteria and the selection of options for detailed evaluation result from those that passed the screening evaluation plus their hybrids.

The exclusionary criteria are as follows.

1. Compatibility with the Ontario MISA objective of virtual elimination of toxics in discharge to surface water. Chemicals must be controlled through specific control limits for the chemical's toxic characteristics.

2. Compatibility with MISA methods of setting the chemical control limits which are to be based on either best available technology (economically achievable) (BATEA) or on receiving water quality derived from a receiving water quality impact assessment which may be even more stringent in some cases than BATEA.

3. Compatibility with the basic jurisdictional framework of Ontario which has a set of powers in the area of water and wastewater control which may be delegated from the Province through Regional Municipalities (or organized counties) to municipalities (or townships).

In the discussion that follows control options from Canada, England and Japan are identified and considered in light of these criteria. These options do not meet the criteria and are excluded from further study.

9.3.2 Canada

For Canada, it appears the April 1987 Ontario Draft Model Sewer Use Control By-Law is as advanced as any other control program. The model by-law (see Section 3.2) is recognized as an improvement over previous model by-laws and can be considered intermediary between the model by-law dating from the 70's and an advanced system which may result from the MISA Initiative. Municipalities wanting to update their sewer use control or wanting to implement a first control instrument should be considering this model at this time.

The April 1987 Draft Model By-Law is one that uses an Industrial Effluent Quality Standard and it is intended to be enforced locally. Indeed, at present, the authority to enact and enforce sewer use control is vested with municipalities through authority of the Municipal Act and the Ministry of Municipal Affairs. The Ontario Draft Model By-Law would in the present situation be adopted locally under this sort of delegation of authority. A problem arises in that, at present, the MOE does not have direct authority over municipal sewer use control. While the December 1986 amendments to the EPA requires Provincial Ministries to comply with the EPA, there remains control functions, like program audits, that remain under the authority of Municipal Affairs.

The fiscal system implied by the Draft Model By-Law is a direct cost to industry. Except for some instances of surcharging for excessive conventional loadings, the Ontario Draft By-Law does not offer incentives for reducing emissions. The legal system in Ontario is characterized as strict, there being no provision in the model By-Law for negotiating discharge limits.

The Draft Model By-Law addresses other concerns over and above water quality concerns alone. There are provisions to protect the sludge from contamination and general provisions to protect workers and the air environment from contaminants introduced into the sewers.

The Draft Model By-Law suffers a significant shortcoming when compared with the exclusionary criteria on toxics elimination. The By-law does not address toxic organic discharges to the sewer system. Provisions in the By-law do prescribe discharge of toxic wastes as specifically defined by Ontario Regulation 309 but a more general proscription against toxic organics is missing. On this basis the By-law is excluded from further consideration.

9.3.3 England

The English control of sewer use is fundamentally different from any of the other systems studied. In England all water cycle related issues are controlled by Water Authorities whose areas of jurisdiction cross municipal and county boundaries and are defined by the drainage area (watershed) of regional river systems. Within these areas the Water Authority controls all aspects of the water cycle. The law governing sewer use control is the Control of Pollution Act, Pt. II. This law is implemented by a National Council whose members are drawn from the Water Authorities. The Council, through delegation to individual Water Authorities is responsible for permitting discharges (Consents), monitoring compliance and enforcing water quality standards. The Consents system embodies the English propensity to compromise on regulatory issues and was the only system studied that had any suggestion of flexibility in their legal system.

The consents or discharge permits are agreed upon between industry and the regulator after an impact assessment of the effect of the proposed discharge. The impact assessment in the English system is used to determine whether or not a discharge will adversely affect the receiving water for the use intended for it. As such, it is fundamentally different from the impact assessment suggested for the MISA initiative. Under MISA, the impact assessment is meant to determine whether the technology based standard (the categorical pre-treatment standard) leaves residual water quality impacts that are judged unacceptable. It can be argued that the Consents system could, as a result of an impact assessment that showed no significant impacts, permit the discharge of toxics.

This excludes the English system from detailed consideration in Phase II of this study.

In spite of the exclusion of the English system, there are features of the English system as described in detail in Section 5 that could be adopted into an Ontario control option. These features are embodied in the options selected for further study and will be studied in detail in Phase II of this study. Alternately, some of the English control option features and approaches are instructive for the detailed evaluation. Even though the English system is excluded from further detailed study, some of the English features are retained in the study. Some examples are described below.

On the issue of compatibility with the basic political framework of Ontario, the English system has major differences. Obviously a system that ignores local political boundaries in favour of watershed boundaries for the control of issues related to water is fundamentally different from the local/

municipally controlled system in Ontario. There are, however, elements of that experience which may prove useful when the option of having sewer use control set up and enforced by a senior level of government.

Another feature of the English system is the surcharging of sewer use based on pollutant loading. The techniques and effectiveness of that feature may be useful in the detailed evaluation phase of this study.

9.3.4 Japan

The control of sewer use in Japan is in a state of rapid evolution. It was designed to control gross pollution in answer to largely uncontrolled domestic and industrial discharges to the environment. The success achieved in Japan has not been complete for the gross pollutants but at the same time, some advanced concepts have appeared in their control systems.

While only 40% of the population is served by sewers, their control systems are considering evaluating sewer use on a unit operations basis. "Specified Facilities" within industry in general are the basis for determining acceptable pollutant discharge. It can be argued that this designation of special facilities will not address the special considerations that a specific industrial sector may want included in control instruments. However, taken together, a set of Specified Facilities will define conventional waste treatment in a particular industrial sector. In that way, this is an approach to categorical pretreatment standards that can be considered.

The Japanese standards are Industrial Effluent Quality Standards. The "Specified Facilities" discharges, in toto, have to meet these standards. The standards are national in nature, to be applied uniformly across the country. There are site specific aspects of these standards in that they differ for different types of receiving water. The standards are stricter for receiving water of higher inherent quality used as drinking water source or for receiving water supporting more sensitive aquatic species.

The standards in Japan, however, only address a limited set of pollutants and pollution indices. They do not speak to a comprehensive range of toxics that are known to be present in wastewater from an industrial society. As such the Japanese sewer use control system is excluded from further detailed consideration.

The detailed evaluation in Phase II of this study can look to Japan for any merit in the Specified Facilities approach to pretreatment standards. The hierarchy of receiving waters is another characteristic feature of the Japanese system that may have valuable lessons for the detailed evaluation. Finally, the data supplied by the contacts in Japan was fairly detailed particularly in the description of the administrative set up of their sewerage bureaus. This will be helpful in considering the administrative aspects of the control options choosen for detailed evaluation in Phase II of this study.

9.4 Selection of Options

As introduced previously, the selected options are to be described as Pretreatment Standards (PS) or Industrial Effluent Quality Standards (IEQS). All control options can

be categorized as either PSs or IEOSs. The options selected for further study are characterized under the headings PS or IEQS. The distinguishing features of individual PSs or IEQSs are referred to as subsidiary features. A summary of the overall logic in selecting eight options for detailed evaluation is given in Table 9-2. This table helps to illustrate how the selected options were derived. That discussion is given immediately below, followed by a more detailed discussion on each of the PS and IEQS options.

In Table 9-2, the four specific examples of control options that were identified as passing the screening evaluation are listed first. These are:

- US PS options operating under state approved program
- US PS options operating under federal program
- French PS Option
- German IEQS option.

The subsidiary features characterize these options using the terminology "senior", "junior", "cost", "incentive" and "strict" as defined earlier, Section 9.2. The first important observation is that all the selected options that meet the MISA exclusionary criteria operate under a "strict" legal system. Based on this observation, it has been concluded that the only options recommended for detailed evaluation be those based on strictly applied sewer use controls. As such, in developing hybrid options, this subsidiary feature has been dropped as a variable.

The hybrid options identified in Table 9-2 are discussed below. However, as it is worthwhile to indicate here that the method of generating the hybrid was to alter just one feature from those control options for which specific

TABLE 9-2

FEATURES OF SELECTED OPTIONS

Example	Regulation Setter	Regulation Enforcer	Fiscal Policy	Legal System
	SUBSIDIARY FEATURES			
Specific Pretreatment Standards (PS)				
U.S. - State Approved Program (PS-1)	Senior	Junior	Cost	Strict
U.S. - Federally Approved Program (PS-2)	Senior	Senior	Cost	Strict
France (PS-3)	Senior	Senior	Incentive	Strict
Specific Industrial Effluent Quality Standards (IEQS)				
Germany IEQS-1	Senior	Junior	Cost	Strict
Hybrid PS				
PS-4	Senior	Junior	Incentive	n/a
PS-5	Junior	Junior	Cost	n/a
Hybrid IEQS				
IEQS-2	Senior	Senior	Cost	n/a
IEQS-3	Senior	Junior	Incentive	n/a

n/a: All legal systems studied were "strict", therefore this subsidiary feature is not a variable for the hybrid systems.

examples had been identified. It is felt that by allowing only one subsidiary feature to change the hybrid control option would have a reasonable close identity with some reality and thus would make the detailed evaluation more plausible.

Finally, it is noted that the regulation setter for the specific examples was always the senior level of government. It could be argued that only senior level regulation setting should be considered (see Section 9.2). Effectively, it was never found nor would it ever occur that junior level government make regulations that would be enforced by a senior level of government. Therefore, only options with junior enforcement of regulation made by junior governments are considered.

9.4.1 Pretreatment Standards

United States. Sewer use control in the U.S. meets the exclusionary criteria for MISA and as such is the first examples of control options to be selected for detailed evaluation.

Sewer use control in the U.S. is based on categorical pretreatment standards enforced at the municipal level, the state level or the national level. The U.S. system is structured such that control can be enforced at the local level (junior level) of government or the senior level of government. As a result, the U.S. provides working of examples of two control options for detailed evaluation.

The standards are technology based performance standards tied to a list of hazardous/toxic priority pollutants. This approach explicitly meets two of the prime MISA criteria; toxics elimination and method of application of the regulations. The U.S. approach specifically addresses a list of toxics, the so-called 126 priority pollutants. The method of application, pretreatment standards based on Best Available Technology, matches one of the two proposed methods of discharge control under MISA.

As to the criterion of compatibility with the political system, there is, on the surface, an apparent difference of approach in the U.S. because the ultimate authority and driving force for regulation comes from the federal EPA. However, in the U.S. there is, in some states, a strong desire to control their own affairs in the environmental areas. The U.S. system recognizes this and permits delegation of authority to the state level. Effectively, then, a system is in place where state control over waste parallels the Canadian situation where waste control is a local matter for which the provinces have constitutional authority. At the local level, the U.S. system can differentiate the various municipal functions and sewer control can rest with a separate authority. This is somewhat different from the integrated municipal services set up in Ontario but this difference is not considered significant enough to prevent considering the U.S. system for Ontario. In summary, as introduced before, if the concepts of junior and senior government are considered (Section 9.2), then there is no difficulty in equating the U.S. and Ontario jurisdictional arrangements.

As indicated in Table 9-2, the fiscal approach to sewer use control in the U.S. is a direct cost to industry.

Summarizing the system in the U.S. there are two pretreatment standards extant that will be subjected to detailed evaluation, namely:

PS-1 **A categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set by the senior level of government but enforced by the junior level of government.**

PS-2 **A Categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set and enforced by the senior level of government.**

France. The French control of municipal sewer use is an example of categorical pretreatment regulations based on best available technology (economically achievable) which are enforced by an agency removed from the local scene.

The enforcement in France seems to be taken away from the local level. The local agglomeration or cooperatives of a number of "communes" own and operate the sewage systems but they are limited in their enforcement authority. The enforcement comes from an arm of the national Ministry, the Direction Regionale de L'Industrie et de la Recherche (DRIR), with other ministries having a measure of control when the impact affects their area of responsibility. Furthermore, impacts are assessed differently in different geographic/ natural settings. On balance there seems to be considerable difference between the political systems in Ontario and France that affects enforcement.

However, if the concept of senior and junior level of government is applied to the French system, parallel organizations in France and Ontario can be identified for the purpose of this study.

The basic law is a 1976 law which identifies 418 separate industrial categories or "Installations Classes" for which effluent limits have been established particular to each "Installation". Dischargers to sewer must comply with effluent limits established in this code. The types of pollutants regulated include the gross pollutants that traditionally interfere with the basic operation of the sewage plant, explosive/fire hazards, corrosive elements, hot and acutely toxic pollutants. Also the pollutants like BOD, SS and nitrogenous components that affect the operation of a sewage plant are included. Further, toxic metals and organics are listed where an industry is known to produce these pollutants.

This law is a type of categorical pretreatment standard that generally meets the MISA objective of eliminating toxic pollutants. Further the use of BAT on a categorical basis is consistent with one of the possible modes of implementing MISA requirements.

Two other features of the French system are worth noting for further consideration. First the method of permitting some new discharges involves a public notification and public hearing process. Submissions are made to a "Conseil d'Hygiene" which reports back to the DRIR on an application prior to approval. This is an interesting application of a public input process governing essentially private under-takings.

The other feature of interest is the method of cost recovery for the use of sewer systems. In the approval process, "normal loadings" are determined and the sewer use charges are based on a coefficient of pollution, i.e. the "actual

loading" compared to the "normal loading". In this way there is an incentive to reduce loadings to save on the cost of waste management.

This feature of the French control system differentiates it from the US PS control options in that fiscal flexibility is a new feature . Therefore the third PS is defined as:

PS-3 **A categorical pretreatment standard based on BAT that offers industry a fiscal incentive to reduce pollution. Regulations are set and enforced by a senior level of government.**

Hybrids. Considering the 3 PSs described above, there are two hybrids that results from changing one of the subsidiary features. The fourth and fifth PSs results namely:

PS-4 **A categorical pretreatment standard based on BAT that offers industry a fiscal incentive to reduce pollution. Regulations are set by a senior level of government but enforced by a junior level of government.**

PS-5 **A categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set and enforced by the junior level of government.**

9.4.2 Industrial Effluent Quality Standards

Germany. The type of regulation in place in Germany is in a state of change. Nominally it is an Industrial Effluent Quality Standard type of regulation based on reference to a

guideline. Recent developments in law have introduced concepts of strictly enforceable limits based on best available technology as a means of establishing discharge limits. Also, there are initiatives to make the discharge limits specific to an industry so that categorical standards may be the eventual result of present deliberations. Local authorities can adopt local provisions and the tendency seems to be the adoption of the strictest water quality standard so that the resulting control instruments tend to be based on industrial effluent quality standards. These standards do include toxics where they are known to occur so that the German system does have a compatibility with the Objectives of the MISA program. They potentially use the strictest industrial effluent quality standards rather than just categorical pretreatment standards so that the MISA objective of local impact assessment is met.

In many ways the German system for controlling discharges to sewers and surface waters is very similar to the Ontario system including the involvement of the federal government on some wastewater issues. The German system vests power over wastewater control with the federated states (Lander) that comprise the German national state. The Lander delegate the control of indirect discharges down to the local level through district governments that have a parallel in our Regional government set-up. The day-to-day operation and enforcement is at the lowest authority level, with the responsibility for implementing laws left at the state level through an agency for water and waste drawn from representative of the various districts.

The National Government takes a more active role in initiating legislation on environmental affairs than in Canada, although through their two-tiered parliamentary system the Bundesrat which is a creature of the Lander must approve of

laws initiated in the Bundestag. Some of the Federal laws tends to be generic in nature leaving implementation methods to the Lander through the Lander Arbeitsgroupe fur Wasser und Abfall (LAWA). Other federal laws can be quite specific and can be considered as national standards that the Lander have have agreed with the federal government but which the Lander have the power to implement and enforce locally. While there are differences between the Ontario and German political systems, the effective way that wastewater is controlled could be adapted easily to Ontario.

There are no fiscal incentives offered in German control option so that the fiscal policy is that sewer use control is a direct cost to industry.

The German system is the single specific example of an IEOS namely:

IEQS-1 An industrial effluent water quality standard that is a direct cost to industry. Regulations are set by the senior level of government and enforced by the junior level of government.

Hybrids. There are two hybrids of the IEOS-1 option that are based on one change from the German options, namely.

IEQS-2 An industrial effluent water quality standard that is a direct cost to industry. Regulations are set and enforced by the senior level of government.

IEQS-3 An industrial effluent water quality standard that offers industry an incentive to reduce pollution. Regulations are set by the senior level of government but enforced by the junior level of government.

9.5 Summary of Selected Options

The following are the options to be carried forward for evaluation in Phase II.

PS-1 A categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set by the senior level of government but enforced by the junior level of government.

PS-2 A Categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set and enforced by the senior level of government.

PS-3 A categorical pretreatment standard based on BAT that offers industry a fiscal incentive to reduce pollution. Regulations are set and enforced by a senior level of government.

PS-4 A categorical pretreatment standard based on BAT that offers industry a fiscal incentive to reduce pollution. Regulations are set by a senior level of government but enforced by a junior level of government.

PS-5 A categorical Pretreatment Standard based on BAT that is a direct cost to industry. Regulations set and enforced by the junior level of government.

IEQS-1 An industrial effluent water quality standard that is a direct cost to industry. Regulations are set by the senior level of government and enforced by the junior level of government.

IEQS-2 An industrial effluent water quality standard that is a direct cost to industry. Regulations are set and enforced by the senior level of government.

IEQS-3 An industrial effluent water quality standard that offers industry an incentive to reduce pollution. Regulations are set by the senior level of government but enforced by the junior level of government.

10. AN INTRODUCTION TO THE EVALUATION OF OPTIONS

The long list of policy options previously identified will be evaluated in the second phase of this study. This chapter briefly outlines the methodology to be utilized. The approach is preliminary and will be refined, iteratively, as it is applied. It is included in this report as an introduction to the second phase of our study.

The evaluation methodology selected is an effectiveness-cost approach. Basically, the approach involves a qualitative assessment of the effectiveness and cost for each policy option and a comparison of the options based on a qualitative weighting of these two factors. The key aspect of the approach is the definition of these two factors as a guide for the assessment of options. The remainder of this chapter presents the preliminary factor definitions.

10.1 Program Effectiveness

Effectiveness is a measure of how well a program meets its goal. MISA's ultimate goal is "the virtual elimination of toxic contaminants in municipal and industrial discharges into waterways".

Although waterways is the sole receptor explicitly referred to in the policy statement, other environmental receptors are also meant to be protected. These include the STP workers health and safety (through various contact pathways), the air (through volatilization) and the soil (through sludge disposal). This is a reflection that the STP is the physical receptor for the contaminants of concern in this study.

Thus, the effectiveness of the policy options will be judged as to the extent to which they would reduce toxic discharges impacting:

- o receiving water body quality;
- o worker health and safety;
- o air quality; and
- o soil quality.

This effectiveness can best be measured along four dimensions: technical, economic, legislative and organizational and administrative. Technical effectiveness refers to the predicted improvement of environmental quality based on the standards set. Economic effectiveness refers to the efficiency and fairness of the program. Legislative effectiveness refers to the enforceability, understandability and flexibility of the program's resulting legislation. Finally, organizational and administrative effectiveness refers to the ease with which the program would fit into existing structures.

The assessment of a program's overall effectiveness is, thus, done in two steps. First, the technical, economic, legislative and administrative and organizational effectiveness are assessed for each option. Second, these four sub-factors are qualitatively weighted. The options are then ranked based on the qualitative assessments and weightings of sub-factors.

The final issue to address is the definition of each of the four sub-factors. For each sub-factor, a set of "achievement" criteria are developed. Each policy option is assessed based on these criteria which are introduced, briefly, below. While the evaluation will primarily utilize qualitative

assessments and weightings, a numerical analysis will also be used as a cross-check to the qualitative analysis.

10.1.1 Technical Effectiveness

Seven criteria have been developed in order to assess the technical effectiveness of the sewer use control option. These are: water quality improvement, intermedia transfers, industrial compliance, monitoring, program review and update, comprehensiveness, and, analytical feasibility. These criteria are defined below.

Water Quality Improvements

The existence of water quality impact assessment in a program will be used to indicate whether there is a basis for a judgement regarding water quality improvements. The improvements are likely greatest if the assessments are probing, consider many factors and are rigorously considered.

Intermedia Transfers

One of the contexts that need to be considered in assessing comprehensiveness is the extent to which a program permits removal of a water pollutant at the expense of contamination in another medium including air and soil. Also of concern should be impacts on STP worker health and safety. A program would be more effective if such transfers were specifically prevented.

Industrial Compliance

The technical effectiveness of programs can be assessed by the number (fraction, percent) of industries that are in compliance. This is slightly different from an assessment of water quality improvement since water quality may not be acceptably improved even though industry is largely in compliance.

Monitoring

The effectiveness of the program can be assessed by examining the monitoring programs mandated by the regulations. The extent of the analysis required and the level of data required, all contribute to the assessment of the effectiveness of the monitoring program. A more effective program would be typified by a program that is supported by quality assurance/quality control (QA/QC) programs.

Program Review and Updating

For a program to remain effective, there needs to be an ongoing provision in the program to review, assess and update the provisions. This review could address a variety of issues like:

- analytical technology;
- new awareness of the impact of toxics;
- new water treatment advances;
- changing economic circumstances.

Regulatory Comprehensiveness

Regulatory programs address lists of chemical parameters of varying length and applicability. While ultimate length is not necessarily a criterion, a more comprehensive list that addresses specific concerns nominally will mean a more effective program.

Analytical Feasibility

There can be a tendancy in environmental regulation to set effluent limits at unrealistically low levels often approaching analytical detectability for some parameters. This criterion measures the practicality of the limits suggested. A more effective program would have practical limits.

10.1.2 Economic Effectiveness

Five criteria have been developed in order to assess the effectiveness of the sewer use control program on economic grounds. These are: efficiency, cost effects on industry, cost effects on municipalities, perceived fairness and the potential to mitigate cost effects. The criteria are defined below.

Efficiency

Efficiency measures the extent to which industries can and do minimize their costs while achieving or exceeding discharge requirements set in the long run.

Cost Effects on Industry

This measures the burden that the costs of the program places on industries. This is a relative measure of cost, not absolute. For example, the project related costs may be a small percentage of industries' total cost, thus having a relatively small impact.

Cost Effectiveness on Municipalities

As for industries, this is meant to measure the relative impacts of the costs of the sewer use control program for municipalities.

Perceived Fairness

This measures the extent to which industries and/or municipalities view the sewer use control program and enforcement practices as being fair. For example, can large industries/municipalities easily circumvent standards while small ones cannot? A stated objective of MISA is to be equitable or even handed in regulation making and enforcement.

Potential to Mitigate Cost Effects

In an attempt to be equitable or even handed, some 'special' industries and/or municipalities may face an enormous additional cost burden due to the program as compared to the average. This criteria measures the extent to which relief for those industries/municipalities is possible.

10.1.3 Legislative Effectiveness

Eight criteria have been developed in order to assess the legislation effectiveness of the sewer use control programs. Laws are the means through which the objectives of the program are attempted to be carried out. The legislative effectiveness criteria, taken together, attempt to measure whether industries and municipalities would "rationally" comply with the requirements of the program. They are: effectiveness of prosecution procedure, ability to prosecute, success in prosecution, challenges to the law, legal non-compliance, time to implement program, flexibility of the law and understandability.

Procedure Leading to Prosecution

This is a measure of the time required to detect violations under normal enforcement practices. If the procedures result in longer detection times, then the legislation should be considered less effective.

Ability to Prosecute

This measures the extent to which the enforcement agency's ability to prosecute is reduced based on other legal controls on their actions. (For example, is the agency allowed access to industrial sites for testing?)

Success in Prosecution

This measures the extent to which prosecutions are brought forward and convictions are obtained. If few cases have

been brought up and convictions result infrequently, industries may judge the risk of non-compliance to be outweighed by the cost of compliance.

Challenges to the Law

Even if many convictions exist, the presence of legal challenges to the law may lead industries to believe that the program may be repealed or changed significantly, making non-compliance rational. Laws that have had court challenges are considered less effective.

Legal Non-Compliance

Mechanisms (such as control orders) may exist such that certain industries or municipalities can circumvent requirements through negotiated standards. Programs for which these mechanisms may be overly exploited are legislatively less effective.

Time to Implement Program

As the legislation is being developed, the pollution problems persist. The sooner the program can come into force for all municipalities and industries the better.

Flexibility of the Legislation

With new scientific knowledge, the requirements of the program may, in hindsight, be too lenient or too stringent. It would be desirable to have a flexible set of laws to respond to changing circumstances.

Understandability of the Legislation

If the intent of the program is not clearly laid out in the legislation, it may not be appropriately carried out or enforced. It is, thus, imperative for an effective program to have simple, understandable legislation.

10.1.4 Organizational and Administrative Effectiveness

Four criteria have been developed in order to assess the effectiveness of the sewer use control program based on organizational and administrative requirements. The four criteria are: enforcement agency resources, municipal resources, lab capacity and record-keeping requirements. They are meant to measure the additional burden due to the programs.

Enforcement Agency Resources

This measures the level of enforcement agency resources (staff number, equipment and facilities) requirements due to the program. It specifically addresses the likely additional resources required for inspection, sampling, analysis and administrative duties.

Municipal Resources

This is a similar measure to that above for municipalities. This is reflected in the additional resources for

implementation of the program, administration, monitoring and enforcement and any expansion or upgrading requirements for municipal treatment facilities.

Lab Capability

This measures the adequacy of industrial, municipal and provincial labs to meet the demands of the program in terms of facilities, equipment and personnel. A lack of lab capacity would likely result in enforcement and prosecution delays hindering the overall effectiveness of the program.

Record-Keeping Requirements

This measures the level of data keeping requirements necessary to carry out the program. An excessive or unmanageable level of data keeping would likely lead to delayed enforcement or, possibly, ignored industry. This would both hinder prosecutions and encourage non-compliance.

10.2 Program Costs

Two types of costs will be utilized: monetary and social. Monetary costs are all dollar outlays resulting as a consequence of the various programs. These include required capital improvements to treatment or pretreatment facilities and operations costs. Operations costs include enforcement, monitoring and testing requirements as well as annual operations and maintenance expenses for the capital facilities. These costs will be determined based on actual operating experience elsewhere.

Social costs are more difficult to define or quantify. Most of the social costs will be negative (i.e. social benefits result) accruing to those groups that perceive water as a resource (e.g. sport fishermen) due to reductions in toxic loadings. These are ignored in this analysis since benefits are captured by the program effectiveness measure.

Some social costs will result due to capital projects required as a result of the programs, and should be incorporated into the analysis. For example, noise, dust and traffic impacts due an additional treatment facility required as a result of the program are social costs. Similarly, likely disruption and displacement effects for land uses and residences should be considered where capital projects are likely required.

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appendices

APPENDIX 1

CONTAMINANTS LIST FROM THE TERMS OF REFERENCE

APPENDIX 1

CONTAMINANTS LIST FROM THE TERMS OF REFERENCE

The Terms of Reference for this study had appended a list of target compounds and parameters that were to be used as a reference list for the study. The contaminants, 151 in total, were organized into groupings that were handled in a similar manner in a laboratory analysis, viz:

Volatiles	- Table 1-1
Base/Neutral and Acid Extractables	- Table 1-2
Extractables, Pesticide Group	- Table 1-3
Dioxins and Furans	- Table 1-4
Metals	- Table 1-5
Conventional Parameters	- Table 1-6

The last listing, conventional parameters, do not fit the same grouping rate as the others but were included in the listings with the Terms of Reference. They are included here for completeness and as a reference when the term is used in the text of this report.

TABLE 1-1

VOLATILES

Acrolein
Acrylonitrile
Benzene
Benzyl chloride (alpha-chlorotoluene)
Bromodichloromethane
Bromoform
Bromoethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dibromochloromethane
1,1-Dichloroethane
1,2-Dichloroethane
Dichloroethane
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
Methyl chloride (dichloromethane)
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1 1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
Vinyl Chloride
Bromodichlorobenzene
3-Chloro-1-propene
3-Chloro-toluene
Diethyl ether
1,2-Dimethyl benzene (o-Xylene)
1,3-Dimethyl benzene (m-Xylene)
1,4-Dimethyl benzene (p-Xylene)
Hexane
Hexanol
1-Octene
Styrene
Vinyl bromide

TABLE 1-2
BASE/NEUTRAL AND ACID EXTRACTABLES

Acenaphthene	Di-n-octyl phthalate
Acenaphthalene	2,4-Dinitrophenol
Anthracene	2,4-Dinitrotoluene
Benzo(a)anthracene	2,6-Dinitrotoluene
Benzo(a)pyrene	Fluoranthene
Benzo(b)fluoranthene	Fluorene
Benzo(ghi)perylene	Ideno(1,2,3-cd) pyrene
Benzo(k)fluoranthene	2-Methyl-4,6-dinitrophenol
Benzyl butyl phthalate	Naphthalene
Bis(2-chloroethyl)ether	Nitrobenzene
Bis(2-chloroethoxy)methane	2-Nitrophenol
Bis(2-chloroisopropyl)ether	4-Nitrophenol
Bis(2-ethylhexyl)phthalate	N-Nitrosodimethylamine
4-Bromophenyl phenyl ether	N-Nitrosodi-n-propylamine
4-Chloro-3-methylphenol	N-Nitrosodiphenylamine
(4-chloro-m-cresol)	Pentachlorophenol
2-Chloroethylvinyl ether	Phenanthrene
2-Chloronaphthalene	Phenol
2-Chlorophenol	Pyrene
4-Chlorophenylphenyl ether	2,4,6-Trichlorophenol
Chrysene	Biphenyl
Dibenzo(a,h)anthracene	Diethyl hexyl phthalate
2,4-Dichlorophenol	Diphenyl ether
Diethyl phthalate	2-Hydroxy-toluene (o-Cresol)
2,4-Dimethylphenol	3-Hydroxy-toluene (m-Cresol)
Dimethyl phthalate	4-Hydroxy-toluene (p-Cresol)
Di-n-butyl phthalate	alpha-naphthylamine

TABLE 1-3

EXTRACTABLES, PESTICIDE GROUPS

Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260
1,2,4-Trichlorobenzene
Aldrin
Ametryn
Atrazine
alpha-BHC
beta-BHC
gamma-BHC (Lindane)
delta-BHC
Captan
Chlordane
2,4-D
4,4'-DD
4,4'-DDE
4,4'-DDT
Diazinon
Dichloran
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulphate
Endrin
Endrin Aldehyde
Heptachlor
Heptachlor epoxide
Malathion
Methoxychlor
Mirex
Oxychlordane
Parathion methyl
Parathion ethyl
PCNB
Photomirex
Strobane
2,4,5-T
2,4,5-tp (Silvex)

TABLE 1-4

DIOXINS AND FURANS

2,3,7,8-Tetrachloro-dibenzo-dioxin
2,3,7,8-Tetrachloro-dibenzo-furan

TABLE 1-5
METALS

Aluminum
Antimony
Beryllium
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Mercury
Molybdenum
Nickel
Selinium
Silver
Tin
Thallium
Zinc
Arsenic
Barium

TABLE 1-6
CONVENTIONAL PARAMETERS

BOD
COD
Total Suspended Solids
Volatile Suspended Solids
Total Phosphorus
Total Nitrogen
Ammonia
Nitrate
Nitrite
Total Phenol (by 4AAP)
pH
Turbidity
Dissolved Organic Carbon
Dissolved Inorganic Carbon
Cyanide

APPENDIX 2
ONTARIO EFFLUENT MONITORING
PRIORITY POLLUTANT LIST

APPENDIX 2
ONTARIO EFFLUENT MONITORING
PRIORITY POLLUTANT LIST

A MISA task force, MISA Priority Pollutants Task Force, developed and applied a methodology to assess the chemical hazard of candidate chemicals for inclusion on a list of chemicals for which monitoring data may be required under MISA regulations. The initial application of methodology produced the following list of chemicals numbering 183 entries. The list was published in a report for review only dated March 6, 1987.

The list is reproduced here to provide the reader with an understanding of the scope of the MISA contaminant targets.

For additional information of the origins of the list and the ongoing assessment and reassignment of chemical, the reader is referred to the MOE report and updates thereto. The list is similar to that found in Appendix 1, it is longer (183 chemicals), reflecting a later state of development of the list of chemicals of concern. The list is arranged alphabetically rather than according to analytical methodology. Conventional parameters are not included.

Abietic Acid
Acenaphthene
Acenaphthene, 5-nitro
Acenaphthylene
Acridine
Acrolein
Acrylonitrile
4-Allyl-1,2-dimethoxy benzene
Aluminum
4-Anninoazobenzene
Aniline
Anthracene
Antimony
PCB 1016
PCB 1221
PCB 1232
PCB 1242
PCB 1248
PCB 1254
PCB 1260
Arsenic
Benzaldehyde
Benz(a)anthracene
Benzene
Benzeneacetonitrile
Benzidine
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
Benzyl alcohol
Beryllium

Biphenyl
Bromoform
Bromomethane
4-Bromophenl phenyl ether
1,3-Butadiene
Butanal
Butylbenzylphthalate
Cadmium
Camphene
Carbon tetrachloride
Chlorinated dibenzofurans
Chlorinated dibenzo-p-dioxins
Chlorobenzene
Chlorodehydroabietic acid
Chlorodibrometnane
Chloroform
Chloromethane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(chloromethyl)ether
4-Chloro-3-methylphenol
1-Chloronaphthalene
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenylphenyl ether
Chromium
Chrysene
Cobalt
Copper
a-Cresol
o-Cresol
p-Cresol
Cyanide
Dibenzo(a,h)anthracene
2,6-Di-t-butyl-4-methylphenol
Di-n-butylphthalate
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dicnlorobenzidine
1,1-Dichloroethane
1,2-Dichloroethane
trans-1,2 Dichloroethylene
1,2-cis-Dichloroethylene
1,1-Dichloroethylene
2,4-Dichlorophenol
2,6-Dichlorophenol
1,2-Dichloropropane
cis-1,3-Dichloropropylene
trans-1,3-Dichloropropylene
bis(2-ethylhexyl)phthalate
Dimethyl disulphide
2,4-Dimethylphenol
4,6-Dinitro-o-cresol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
1,4-Dioxane
Diphenylamine
Diphenyl ether
Ethylene dibromide
Eugenol
Fluoranthene
Fluorene
Formaldehyde
Hexachlorobenzene
Hexachlorobutadiene (HCBD)
Hexachlorocyclopentadiene
Hexachloroethane
Hydrazine
Hydroxycylohexane
2-Hydroxybiphenyl
4-Hydroxybiphenyl
Indeno(1,2,3-cd)pyrene
Indole
Isopimaric acid
Lead
Levopimaric acid
Limonene
Mercapto benzothiazole
Mercury
Methylene chloride
Methyl ethyl ketone
n-Methylformamide
1-Methylnaphthalene
2-Methylnaphthalene
Methyl styrene
Molybdenum
Naphthalene
1-Naphthylamine
2-Naphthylamine
Neoabietic acid
Nickel
1-Nitronaphthalene
2-Nitronaphthalene
4-Nitrophenol
n-Nitrosodimethylamine
n-Nitrosodi-n-propylamine
n-Nitrosodiphenylamine
Octachlorostyrene
Oleic Acid
Pentachlorobenzene
Pentachlorophenol

Perylene
Pehenanthrene
Phenol
Pimaric Acid
Pyrene
Selenium
Silver
Styrene
Tetrachloroacetone
1,1,3,3-Tetrachloroacetone
1,2,3,4-Tetrachlorobenzene
1,2,3,5-Tetrachlorobenzene
1,2,4,5-Tetrachlorobenzene
2,3,7,8-Tetrachlorodibenzo-p-dioxin
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Tetrachloroguaiacol
2,3,4,5-Tetrachlorophenol
2,3,4,6-Tetrachlorophenol
2,3,5,6-Tetrachlorophenol
Tetraethyl lead
Thallium
Thiourea

Toluene
Tributyl phosphate
1,1,3-Trichloroacetone
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
1,1,2-Trichloroethane
Trichloroethylene
Trichlolrofluoromethane
Trichloroguaiacol
2,3,4-Trichlorophenol
2,3,5-Trichlorophenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
3,4,5-Trichlorophenol
2,4,5-Trichlorotoluene
Triethyl lead
Trimethylbenzenes
Trimethylnaphthalene
Vanadium
Vinyl Bromide
Vinyl Chloride
o-Xylene
m-Xylene
p-Xylene
Zinc

APPENDIX 3

DRAFT ONTARIO MODEL BY-LAW

A MODEL BY-LAW

TO CONTROL

WASTE DISCHARGES

TO

MUNICIPAL SEWERS

APRIL 22, 1987

Prepared by a Committee represented by:

The Ontario Ministry of the Environment

Environment Canada

The Ontario Municipal Engineers Association

BY-LAW NO.

OF THE CORPORATION OF THE OF

BEING A BY-LAW (set out purpose)

pursuant to (set out statutory authority)

NOW THEREFORE THE COUNCIL of the CORPORATION

of the of enacts as

follows:

SECTION 1

DEFINITIONS

1. In this by-law

(a) "acute hazardous waste chemical" means a material which is an acute hazardous waste chemical within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(b) "biochemical oxygen demand" means the quantity of oxygen utilized in the biochemical oxidation of matter in five (5) days at twenty (20) degrees celsius;

(c) "combined sewer" means a sewer intended to function simultaneously as a storm sewer and a sanitary sewer;

(d) "commercial waste chemical" means a material which is a commercial waste chemical within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(e) "fuels" means gasoline, naptha, diesel fuel or fuel oil;

(f) "hazardous industrial waste" means a material which is a hazardous industrial waste within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(g) "hazardous waste chemical" means a material which is a hazardous waste chemical within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(h) "matter" includes any solid, liquid or gas;

(i) "municipality" means the Corporation of the
of

(j) "pathological waste" means a material which is a pathological waste within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(k) "PCB waste" means a PCB waste within the meaning of Ontario Regulation 148/86 made under the Environmental Protection Act (Ontario);

(l) "pesticides" means a pesticide regulated under the Pesticides Act (Ontario);

(m) "pH" means the logarithm to the base 10 of the reciprocal of the concentration of hydrogen ions in grams per litre of solution;

(n) "phenolic compounds" means those derivatives of aromatic hydrocarbons which have a hydroxyl group directly attached to the ring;

(o) "reactive waste" means a material which is a reactive waste within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(p) "sanitary sewer" means a sewer for the collection and transmission of domestic, commercial, institutional and industrial sewage or any combination thereof;

(q) "severely toxic waste" means a material which is a severely toxic waste within the meaning of Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(r) "sewage" means any liquid waste containing animal, vegetable or mineral matter in solution or in suspension, except uncontaminated water;

(s) "sewage works" means any works for the collection, transmission, treatment or disposal of sewage, or any part of such works;

(t) "Standard Methods" means a procedure set out in Standard Methods for the Examination of Water and Wastewater published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing, or a procedure approved by a designated analyst of the Ontario Ministry of the Environment;

(u) "storm sewer" means a sewer for the collection and transmission of uncontaminated water, storm water, drainage from land or from a watercourse or any combination thereof;

(v) "storm water" means water from rainfall or other natural precipitation or from the melting of snow or ice;

(w) "suspended solids" means solid matter in or on a liquid which matter is removable by filtering;

(x) "uncontaminated water" means water to which no matter has been added as a consequence of its use, or to modify its use, by any person;

SECTION 2

DISCHARGES TO SANITARY SEWERS
DISCHARGES TO COMBINED SEWERS

2(1) No person shall discharge or deposit or cause or permit the discharge or deposit into or in land drainage works, private branch drains or connections to any sanitary sewer or combined sewer,

(a) matter of any type or at any temperature or in any quantity which may be or may become harmful to a sewage works, or which may cause the sewage works effluent to contravene any requirement by or under the Ontario Water Resources Act or the Environmental Protection Act (Ontario), or which may cause the sludge from sewage works to fail to meet the criteria relating to contaminants for spreading the sludge on agricultural lands under Ontario's Guidelines for Sewage Sludge Utilization on Agricultural Lands (as revised January, 1986) unless the person has been advised in writing by the operator of the sewage treatment works that the sludge from the sewage treatment works is never disposed of on agricultural lands, or which may interfere with the proper operation of a sewage works, or which may impair or interfere with any sewage treatment process, or which may be or may become a hazard to any person, animal, property or vegetation and;

(b) without limiting the generality of the foregoing, any of the following:

(i) Sewage that may cause an offensive odour to emanate from a sewage works, and without limiting the generality of the foregoing, sewage containing hydrogen sulphide, carbon disulphide, other reduced sulphur compounds, amines or ammonia.

(ii) Except in the case of discharge into a combined sewer, storm water, water from drainage of roofs or land, water from a watercourse or uncontaminated water.

(iii) Sewage or uncontaminated water at a temperature greater than 65 degrees Celsius.

(iv) Sewage having a pH less than 5.5 or greater than 10.5.

(v) Sewage containing more than ______ milligrams per litre of solvent extractable matter of animal or vegetable origin.

(vi) Sewage containing more than ______ milligrams per litre of solvent extractable matter of mineral or synthetic origin.

(vii) Sewage which consists of two or more separate liquid layers.

(viii) Sewage in which the biochemical oxygen demand exceeds ____ milligrams per litre.

(ix) Sewage containing more than ____________ milligrams per litre of suspended solids.

(x) Sewage containing dyes or colouring material which pass through a sewage works and discolour the sewage works effluent.

(xi) Sewage containing any of the following in excess of the indicated concentrations;

<u>1500 milligrams/litre</u>

Chlorides expressed as Cl
Sulphates expressed as SO_4

<u>50 milligrams/litre</u>

Aluminum expressed as Al
Iron expressed as Fe

10 milligrams/litre

Fluorides expressed as F
Phosphorus expressed as P

5 milligrams/litre

Antimony expressed as Sb
Bismuth expressed as Bi
Chromium expressed as Cr
Cobalt expressed as Co
Lead expressed as Pb
Manganese expressed as Mn
Molybdenum expressed as Mo
Selenium expressed as Se
Silver expressed as Ag
Tin expressed as Sn
Titanium expressed as Ti
Vanadium expressed as V

2 milligrams/litre

Copper expressed as Cu
Cyanide (total) expressed as CN
Nickel expressed as Ni
Zinc expressed as Zn

1 milligram/litre

Arsenic expressed as As
Cadmium expressed as Cd
Phenolic Compounds

0.1 milligrams/litre

Mercury expressed as Hg

(xii) Sewage containing any of the following in any amount;

Acute Hazardous Waste Chemicals
Fuels
Hazardous Industrial Wastes
Hazardous Waste Chemicals
Pathological Wastes
PCB Wastes
Pesticides
Reactive Wastes
Severely Toxic Wastes
Waste Radioactive Materials

2(2) In determining whether the limit with respect to any matter prescribed in subsection 2(1) is contravened any water that has been added for the purpose of enabling the limit to be met shall be disregarded for the purposes of calculating whether the limit has been met so that compliance with the limit cannot be attained by dilution.

2(3) Subclause 2(1) (b)(i) does not apply to prevent the discharge of human waste.

2(4) Subclause 2(1)(b)(xii) does not apply to prevent the discharge of waste radioactive materials where they are being discharged in accordance with a license from the Atomic Energy Control Board authorizing the discharge to a sanitary sewer or combined sewer and a copy of the license has been provided to the municipality.

SECTION 3

DISCHARGES TO STORM SEWERS

3(1) No person shall discharge or deposit or cause or permit the discharge or deposit into or in land drainage works, private branch drains or connections to any storm sewer,

(a) matter of any type or at any temperature or in any quantity which may:

(i) interfere with the proper operation of a storm sewer;

(ii) obstruct a storm sewer or the flow therein;

(iii) be or become a hazard to any person, animal, property or vegetation;

(iv) impair the quality of the water in any well, lake, river, pond, spring, stream, reservoir or other water or watercourse; or

(v) which may result in the contravention of an approval, requirement, direction or other order under the Ontario Water Resources Act or the Environmental Protection Act (Ontario) with respect to the storm sewer or its discharge; and

(b) without limiting the generality of the foregoing any of the following matter:

(i) sewage;

(ii) uncontaminated water at a temperature greater than 65 degrees celsius;

(iii) waste paints and waste organic solvents;

(iv) waste automotive or machine oils and waste greases;

(v) waste pesticides;

(vi) water containing any of the following in excess of the indicated concentrations;

<u>100 micrograms/litre</u>

Arsenic expressed as As
Chromium expressed as Cr
Selenium expressed as Se

<u>30 micrograms/litre</u>

Phosphorus expressed as P
Zinc expressed as Zn

<u>25 micrograms/litre</u>

Lead expressed as Pb
Nickel expressed as Ni

<u>5 micrograms/litre</u>

Copper expressed as Cu
Cyanide (free) expressed as CN

<u>1 microgram/litre</u>

Phenolic compounds

<u>0.2 micrograms/litre</u>

Cadmium expressed as Cd
Mercury expressed as Hg

<u>0.1 micrograms/litre</u>

Silver expressed as Ag

<u>100 per 100 millilitres</u>

Fecal coliforms

3(2) Storm water from public, residential and commercial streets, parking areas and roof drains which discharges to a storm sewer is exempt from the provisions of this section provided none of the matter prohibited by subsection 1 has been added to the storm sewer for the purposes of disposing of the matter.

SECTION 4

REPORTS

4(1) Notwithstanding sections 2 and 3, the owner or occupant of any industrial premises shall not discharge or deposit or cause or permit the discharge or deposit of sewage into or in land drainage works, private branch drains or connections to any sanitary sewer, combined sewer or storm sewer, after the _____ day of _______, unless a Waste Survey Report has been submitted.

(2) The Waste Survey Report shall contain the following information:

(a) name and address of the premises, and names of its owner and occupant;

(b) description of process operations, including average rate of production, hours of operation, and Canadian Standard Industrial Classification codes;

(c) a schematic process diagram indicating waste discharge points and waste descriptions;

(d) the generator registration number, if any, assigned with respect to the premises under Ontario Regulation 309 made under the Environmental Protection Act (Ontario);

(e) the waste class, hazardous waste number, primary and secondary characteristics and analytical data and the laboratory, if any, furnished to the Ontario Ministry of the Environment under Ontario Regulation 309 made under the Environmental Protection Act (Ontario) relating to any material discharged into or in land drainage works, private branch drains or connections to any sanitary, combined or storm sewer.

(3) Where a change occurs in any information described in a Waste Survey Report, the owner or occupant of the premises shall not discharge or deposit or cause or permit the discharge or deposit of sewage into or in land drainage works, private branch drains or connections to any sanitary sewer, combined sewer or storm sewer, after 60 days after the change occurs unless a new Waste Survey Report has been submitted setting out the change.

SECTION 5

AGREEMENTS

5(1) The discharge or deposit of sewage that would otherwise be prohibited by this bylaw may be permitted into or in any connection to any sanitary sewer or combined sewer to an extent fixed by agreement with the municipality under such conditions with respect to payment of additional sewage service rates or otherwise as may be necessary to compensate for any additional costs of operating the sewage works.

5(2) A person who has entered into an agreement with the municipality shall not be prosecuted under Section 2 of this by-law for the discharge or deposit of sewage containing the matters specified in the agreement and in compliance with the agreement during the period within which the agreement is applicable and so long as the agreement is being fully complied with.

SECTION 6

PROGRAM APPROVAL

6(1) A program approval may be issued as set out in subsections (2) to (5) for the discharge of a non-complying effluent during the period of planning, design, construction or installation of facilities to eliminate the non-compliance.

(2) The owner or occupant of commercial, institutional or industrial premises may submit to the municipality a program to prevent or to reduce and control the discharge or deposit of sewage into or in land drainage works, private branch drains or connections to any sanitary sewer or combined sewer from premises.

(3) The owner or occupant of commercial, institutional or industrial premises may submit to the municipality a program to prevent or to reduce and control the discharge or deposit of uncontaminated water or storm water or eliminate the discharge or deposit of sewage into or in land drainage works, private branch drains or connections to any storm sewer from the premises.

(4) The municipality may issue an approval to be known as a program approval to the person who submitted the program.

(5) Every program approval shall be for a specified length of time during which the facilities are to be installed and shall be specific as to the remedial measures to be implemented, the dates of implementation and the materials or other characteristics of the sewage, uncontaminated water or storm water to which it relates.

(6) A person to whom a program approval has been issued shall not be prosecuted under section 2 or 3 of this by-law for the discharge or deposit of sewage, uncontaminated water or storm water containing the matters specified in the program approval and in compliance with the program approval during the period within which the program approval is applicable and so long as the program approval is being fully complied with.

SECTION 7

GENERAL

7(1) Except as otherwise specifically provided in this by-law, all tests, measurements, analyses and examinations of sewage, uncontaminated water and storm water, their characteristics or contents shall be carried out in accordance with Standard Methods;

(2) The owner or occupant of commercial, institutional or industrial premises with one or more connections to a sewage works shall install and maintain in good repair in each connection a suitable manhole to allow observation and sampling of the sewage and measurement of the flow of sewage therein, provided that where installation of a manhole is not possible, an alternative device or facility may be substituted with the approval of the municipality.

(3) The manhole or alternate device shall be located on the property of the owner or occupant of the premises, unless the municipality has given written approval for a different location.

(4) Every manhole, device or facility installed as required by subsection (2) shall be designed and constructed in accordance with good engineering practice and the requirements of the municipality, and shall be constructed and maintained by the owner or occupant of the premises at his expense;

(5) The owner or occupant of commercial, institutional or industrial premises shall at all times ensure that every manhole, device or facility installed as required by subsection (2) is at all times accessible for purposes of observing and sampling the sewage and measuring the flow of sewage therein;

(6) The municipality may require the owner or occupant of commercial, institutional or industrial premises to install devices to monitor sewage discharges and to submit regular reports regarding the discharges to the municipality.

(7) For the purpose of the administration of this by-law, a person appointed by council for the purpose may, upon production of his identification, enter any commercial, institutional or industrial premises, to observe, measure the flow of sewage to any sewer and collect any samples required.

(8) No person shall break, damage, destroy, deface or tamper or cause or permit the breaking, damaging, destroying, defacing or tampering with:

(a) any part of a sewage works; or

(b) any permanent or temporary device installed in a sewage works for the purpose of measuring, sampling and testing of sewage.

(9) Every person who discharges or deposits or causes or permits the discharge or deposit of sewage into or in land drainage works, private branch drains or connections to any sanitary sewer or combined sewer shall, if such discharge or deposit is not in the ordinary course of events forthwith notify the municipality or the agency responsible for operating the sewage works receiving the discharge or deposit.

(10) Every person who discharges or deposits or causes or permits the discharge or deposit of uncontaminated water or storm water into or in land drainage works, private branch drains or connections to any storm sewer shall, if such discharge or deposit is not in the ordinary cause of events forthwith notify the municipality or agency responsible for managing the storm sewer.

(11) The agreement contemplated by section 5 and the program approval contemplated by section 6 may be terminated by the municipality on 30 days written notice.

SECTION 8

OFFENCES

8(1) Every person who contravenes any provision of this by-law is guilty of an offence and on conviction is liable to a fine of not more than $______ for every day or part thereof upon which such offence occurs or continues;

(2) It is the intention of this by-law that all offences created herein are deemed to be of absolute liability.

/rmg
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[illegible] the by-law

4(4) [illegible] survey report will be [illegible] the form attached as Schedule "A".

5(3) The agreements will be in the form attached as Schedule "B" and, upon recommendation of ____________ ________________________________, ____________________ ________________________________ is authorized to execute such agreements under authority of this by-law.

5(4) Where an agreement with the municipality cannot be executed for the acceptance of matter otherwise prohibited by this by-law, the person or owner responsible for the premises shall only be allowed to discharge or deposit sewage into or in land drainage works, private branch drains or connections to any sanitary or combined sewer when an industrial pre-treatment system has been installed and provides an effluent which meets the provisions of the by-law.

6(5) The program approval will be in the form attached as Schedule "C" and, upon recommendation of ____________________, ________________ is authorized to execute such program approvals under the authority of this by-law.

7(1) For the purpose of determining the characteristics of the sewage, uncontaminated water or storm water to which reference is made in this by-law;

(a) one sample alone is sufficient and, without limiting the generality of the foregoing the sample may be a grab sample or a composite sample, may contain additives for its preservation and may be collected manually or by using an automatic sampling device;

(b) except as otherwise specifically provided in this by-law, all tests, measurements, analyses and examinations of sewage, uncontaminated water and stormwater, their characteristics or contents shall be carried out in accordance with Standard Methods;

for each one of the following metals: aluminium antimony, arsenic, bismuth, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, tin, titanium, vanadium and zinc whose concentration is limited in sections 2(1)(b)(xi) and 3(1)(b)(vi), the analysis shall be for the quantity of total metal, which includes all metal both dissolved and particulate;

(d) "phenolic compounds" means phenols as determined by method 510B or 510C in Standard Methods;

(e) "biochemical oxygen demand" means carbonaceous oxygen demand (biochemical) as determined by method 507 in Standard Methods when an inhibiting chemical has been added to prevent ammonia oxidation;

(f) "suspended solids" means total filtrable residue dried at 103-105°C as determined by method 209C in Standard Methods;

(g) "solvent extractable matter of animal or vegetable origin" means grease and oil as determined by methods 503A to 503D in Standard Methods;

(h) "solvent extractable matter of mineral or synthetic origin" means grease and oil as determined by method 503E in Standard Methods;

(i) "cyanide (total)" means cyanide as determined by methods 412B and 412C in Standard Methods;

(j) "composite sample" means a sample which is composed of a series of grab samples taken at intervals during the sampling period;

(k) "grab sample" is a aliquot of the flow being sampled taken at one particular time and place.

SECTION 3 - Waste Characteristics

(a) Source of water supply: ______________________________

____

(b) Type of waste discharged (check all that apply):

TYPE	AVE. FLOW/DAY (m^3/day)	
[ ] sanitary	________	[ ] estimated [ ] measured
[ ] non-contact cooling	________	[ ] estimated [ ] measured
[ ] contact cooling	________	[ ] estimated [ ] measured
[ ] process	________	[ ] estimated [ ] measured
[ ] other	________	[ ] estimated [ ] measured

(c) Wastes are discharged to (check all that apply):

TYPE	AVE. FLOW/DAY (m^3/day)	
[ ] sanitary #1	________	[ ] estimated [ ] measured
[ ] sanitary #2	________	[ ] estimated [ ] measured
[ ] storm sewer #1	________	[ ] estimated [ ] measured
[ ] storm sewer #2	________	[ ] estimated [ ] measured
[ ] ground water	________	[ ] estimated [ ] measured
[ ] surface water	_____	[ ] estimated [ ] measured
[ ] evaporation	_____	[ ] estimated [ ] measured

(d) Expected characteristics of wastes discharged to sanitary and storm sewers (complete Pollutant Information Sheets for the discharge to each sewer).

SECTION 4 - Physical Lay-out

Layout sketch of property (to scale or approximate) to co-ordinate buildings, pretreatment works, property boundaries, effluent lines, and sanitary and storm sewer connections. (Number sewers so that they can be related to Pollutant Information Sheets).

CITY OF ____________________
WASTE SURVEY REPORT

SECTION 1 - General Information

(a) Name of Person Submitting Report: ______________________________
(name)

______________________________ ______________________________
(company, corporation, owner) (telephone no.)

______________________________ ______________________________
(postal address) (postal code)

(b) Company Officer responsible for effluent control:

______________________________ ______________________________
(name) (telephone no.)

(c) Location of Premises:

____
(number, street, or road, municipality)

SECTION 2 - Product or Service Information

(a) Canadian Standard Industrial Classification Codes (SIC)

______________ ______________ ______________

______________ ______________ ______________

(b) Brief description of manufacturing or service activities:

____

____

____

(c) Principal products produced or services rendered:

____

____

____

(d) Number of employees:

plant: ____________ office: ____________

(e) Number of shifts per day: ___ Number of days per week: ____

(f) Are major processes:

[ ] batch [ ] continuous [ ] both

If batch, average number of batches per 24-hour day: _____

(g) Is the production subject to seasonal variation:

[ ] yes [ ] no

If yes, briefly describe seasonal production cycle:

____

____

(h) Is there a special clean-up period: [ ] yes [ ] no

If yes, briefly describe clean-up period activities:

____

____

SECTION 5 - Regulation 309 Information

For wastes discharged into or in connections to any sanitary sewer or combined sewer or storm sewer.

(a) Generator registration number: __________

SECTION 6 - Regulation 309 Information

For wastes discharged into or in connections to any sanitary sewer or combined sewer or storm sewer (complete Section 6 for each sewer).

(a) Description of waste: ____

____

(b) Description of generating process: ____________________________

____

(c) Primary characteristic: ______________________________________

Analytical data (if applicable): _________________________________

____

Name of Laboratory (if applicable): ______________________________

____

Waste Class: ________ Hazardous Waste Number: ____________

(d) Secondary characteristic: ____________________________________

____

Analytical data (if applicable): _________________________________

____

SECTION 7 - Pretreatment

Pretreatment devices or processes used for treating wastes or sludges before discharge to the sanitary sewer system (check as many as appropriate):

[ ] Air flotation
[ ] Centrifuge
[ ] Chemical precipitation
[ ] Chlorination
[ ] Cyclone
[ ] Filtration
[ ] Flow Equalization
[ ] Grease or oil separation, type ____________________
[ ] Grease trap
[ ] Grit Removal
[ ] Ion Exchange
[ ] Neutralization, pH correction
[ ] Ozonation
[ ] Reverse Osmosis
[ ] Screening
[ ] Sedimentation
[ ] Septic tank
[ ] Solvent separation
[ ] Spill protection
[ ] Sump
[ ] Biological treatment, type ______________________________
[ ] Rainwater diversion or storage ______________________________
[ ] Other chemical treatment, type ______________________________
[ ] Other physical treatment, type ______________________________
[ ] Other, type ____
[ ] No pretreatment provided

SECTION 8 - Pollutant Information Sheet (Controlled Matter)

Information for: [ ] sanitary sewer [ ] storm sewer sewer number ____

Indicate by placing an "x" in the appropriate box for each listed parameter whether it is "suspected to be asbent", known to be absent", "suspected to be presented" or "known to be present" and the expected concentration in milligrams per litre.

PARAMETER	KNOWN PRESENT	SUSPECTED PRESENT	KNOWN ABSENT	SUSPECTED ABSENT	CONCENTRATION mg/litre
1. chlorides	[ ]	[ ]	[ ]	[ ]	____
2. sulphates	[ ]	[ ]	[ ]	[ ]	____
3. aluminum	[ ]	[ ]	[ ]	[ ]	____
4. iron	[ ]	[ ]	[ ]	[ ]	____
5. fluoride	[ ]	[ ]	[ ]	[ ]	____
6. phosphorous	[ ]	[ ]	[ ]	[ ]	____
7. antimony	[ ]	[ ]	[ ]	[ ]	____
8. bismuth	[ ]	[ ]	[ ]	[ ]	____
9. chromium	[ ]	[ ]	[ ]	[ ]	____
10. cobalt	[ ]	[ ]	[ ]	[ ]	____
11. lead	[ ]	[ ]	[ ]	[ ]	____
12. manganese	[ ]	[ ]	[ ]	[ ]	____
13. molybdenum	[ ]	[ ]	[ ]	[ ]	____
14. selenium	[ ]	[ ]	[ ]	[ ]	____
15. silver	[ ]	[ ]	[ ]	[ ]	____
16. tin	[ ]	[ ]	[ ]	[ ]	____
17. titanium	[ ]	[ ]	[ ]	[ ]	____
18. vanadium	[ ]	[ ]	[ ]	[ ]	____
19. copper	[ ]	[ ]	[ ]	[ ]	____
20. cyanide	[ ]	[ ]	[ ]	[ ]	____
21. nickel	[ ]	[ ]	[ ]	[ ]	____
22. zinc	[ ]	[ ]	[ ]	[ ]	____
23. arsenic	[ ]	[ ]	[ ]	[ ]	____
24. cadmium	[ ]	[ ]	[ ]	[ ]	____
25. phenolic compounds	[ ]	[ ]	[ ]	[ ]	____
26. mercury	[ ]	[ ]	[ ]	[ ]	____

SECTION 8 - Pollutant Information Sheet (Controlled Matter)

PARAMETER	KNOWN PRESENT	SUSPECTED PRESENT	KNOWN ABSENT	SUSPECTED ABSENT	CONCENTRATION mg/litre
27. BOD	[ ]	[ ]	[ ]	[ ]	______
28. TSS	[ ]	[ ]	[ ]	[ ]	______
29. oil & grease (animal/veg)	[ ]	[ ]	[ ]	[ ]	______
30. oil & grease (mineral/syn)	[ ]	[ ]	[ ]	[ ]	______

SECTION 9 - Pollutant Information Sheet (No Discharge)

Information for: [ ] sanitary sewer number ___

Indicate by placing an "x" in the appropriate box for each listed parameter whether it is "suspected to be asbent", known to be absent", "suspected to be presented" or "known to be present" and the expected concentration in milligrams per litre.

PARAMETER	KNOWN PRESENT	SUSPECTED PRESENT	KNOWN ABSENT	SUSPECTED ABSENT	QUANTITY kg/month
31. pesticides	[ ]	[ ]	[ ]	[ ]	______
32. acute hazardous waste chemicals	[ ]	[ ]	[ ]	[ ]	______
33. fuels	[ ]	[ ]	[ ]	[ ]	______
34. hazardous industrial wastes	[ ]	[ ]	[ ]	[ ]	______
35. hazardous waste chemicals	[ ]	[ ]	[ ]	[ ]	______
36. pathological wastes	[ ]	[ ]	[ ]	[ ]	______
37. PCB wastes	[ ]	[ ]	[ ]	[ ]	______
38. reactive wastes	[ ]	[ ]	[ ]	[ ]	______
39. severely toxic wastes	[ ]	[ ]	[ ]	[ ]	______
40. waste radio-active wastes	[ ]	[ ]	[ ]	[ ]	______

SECTION 10 - Pollutant Information Sheet (Organics-Not Controlled)

Information for: [ ] sanitary sewer [ ] storm sewer sewer number ____

Indicate by placing an "x" in the appropriate box for each listed parameter whether it is "suspected to be asbent", known to be absent", "suspected to be presented" or "known to be present" and the expected concentration in milligrams per litre.

PARAMETER	KNOWN PRESENT	SUSPECTED PRESENT	KNOWN ABSENT	SUSPECTED ABSENT	CONCENTRATION mg/litre
1. tetrachloroethylene	[ ]	[ ]	[ ]	[ ]	____
2. trichloroethylene	[ ]	[ ]	[ ]	[ ]	____
3. methylene chloride	[ ]	[ ]	[ ]	[ ]	____
4. 1,1,1-trichloro-ethane	[ ]	[ ]	[ ]	[ ]	____
5. carbon tetrachloride	[ ]	[ ]	[ ]	[ ]	____
6. chlorobenzenes	[ ]	[ ]	[ ]	[ ]	____
7. xylene	[ ]	[ ]	[ ]	[ ]	____
8. acetone	[ ]	[ ]	[ ]	[ ]	____
9. ethyl acetate	[ ]	[ ]	[ ]	[ ]	____
10. ethyl benzene	[ ]	[ ]	[ ]	[ ]	____
11. ethyl ether	[ ]	[ ]	[ ]	[ ]	____
12. methyl isobutyl ketone	[ ]	[ ]	[ ]	[ ]	____
13. n-butyl alcohol	[ ]	[ ]	[ ]	[ ]	____
14. cyclohexanone	[ ]	[ ]	[ ]	[ ]	____
15. methanol	[ ]	[ ]	[ ]	[ ]	____
16. cresols	[ ]	[ ]	[ ]	[ ]	____
17. cresylic acid	[ ]	[ ]	[ ]	[ ]	____
18. nitrobenzene	[ ]	[ ]	[ ]	[ ]	____
19. toluene	[ ]	[ ]	[ ]	[ ]	____
20. benzene	[ ]	[ ]	[ ]	[ ]	____
21. methyl ethyl ketone	[ ]	[ ]	[ ]	[ ]	____
22. carbon disulphide	[ ]	[ ]	[ ]	[ ]	____
23. isobutanol	[ ]	[ ]	[ ]	[ ]	____
24. pyridine	[ ]	[ ]	[ ]	[ ]	____
25. chloroform	[ ]	[ ]	[ ]	[ ]	____
26. formaldehyde	[ ]	[ ]	[ ]	[ ]	____

SECTION 5 SAMPLE AGREEMENT FORM

THIS AGREEMENT made

this ________________ day of ________________ A.D.19 ___.

BETWEEN: ____

(herinafter called the Municipality)

OF THE FIRST PART

-and- ________________________________

(hereinafter called the Company)

OF THE SECOND PART.

WHEREAS the Municipality enacted By-law No. ______ on the _____ day of ______________, relating to the discharge of sewage in the Municipality; and

WHEREAS the said By-law prohibits the discharge of commercial, institutional or industrial sewage containing certain substances in quantities in excess of the limits set by the By-law but provides that the Municipality may permit the discharge of commercial, institutional or industrial waste which would otherwise by prohibited by the said By-law to an extent fixed by agreement with the Municipality under such conditions with respect to payment or otherwise as may be necessary to compensate for any additional costs of treatment; and

WHEREAS the Company carries on a commercial, institutional or industrial activity within the Municipality at premises known as ________________________ which activity produces a sewage discharge in which the quantity of one or more of Suspended Solids, Biochemical Oxygen Demand (hereinafter referred to as B.O.D.), Phenolic Compounds or solvent extractable matter of animal and vegetable origin (hereinafter referred to as Grease) is above the permissible limits set out in the said By-law which results in materially adding to the cost of treatment at the municipal sewage works.

NOW THEREFORE THIS INDENTURE WITNESSETH that the parties hereto mutually covenant and agree as follows:-

1. During the currency of this agreement the **QUANTITY OF SEWAGE DISCHARGED** by the Company from its premises at ______________________________ to the sanitary sewer or combined sewer system shall not exceed ___________________ cubic metres per day and the **RATE OF SUCH DISCHARGE OF SEWAGE** from the said premises shall not exceed ________ cubic metres per hour.

2. During the currency of this agreement only, the **QUALITY OF THE SEWAGE** discharged by the Company from the said premises to the sanitary sewer or combined sewer system **MAY EXCEED THE LIMITS SET BY THE BY-LAW** with respect to the quantity of Suspended Solids, B.O.D., Phenolic Compounds and Grease provided that they **SHALL NOT EXCEED THE FOLLOWING LIMITS AT ANY TIME.**

(a) Suspended Solids - _____ milligrams/litre
(b) B.O.D. - _____ milligrams/litre
(c) Phenolic Compounds - _____ milligrams/litre
(d) Grease - _____ milligrams/litre

3. **THE DISCHARGE OF SEWAGE BY** the Company from the said premises containing Suspended Solids, B.O.D., Phenolic Compounds or Grease **IN EXCESS OF THE ABOVE LIMITS** shall constitute a contravention of this agreement and thus a contravention of the By-law.

4. **THIS AGREEMENT SHALL REMAIN IN FORCE** from ______________ ___________________ until December 31st, _____, and be automatically renewed on January 1st, _____ and annually thereafter, on the same terms unless a new agreement is reached or this agreement is terminated as hereinafter provided.

5. **THIS AGREEMENT MAY BE TERMINATED BY THE MUNICIPALITY** at any time on 30 days written notice sent by registered mail addressed to the Company at the said premises, if in the opinion of the ____________ __________:

(i) The sewage is causing damage to the sewers, materially increasing their maintenance costs or causing a dangerous condition; or

(ii) The sewage is causing damage to the sewage treatment process or causing a dangerous condition in the treatment works; or

(iii) the sewage is causing the sludge from the sewage works, to fail to meet criteria relating to contaminants for spreading the sludge on agricultural lands under <u>Ontario's Guidelines for Sewage Sludge Utilization on Agricultural Lands</u> (as revised January, 1986), or

(iv) the sewage is causing the sewage works effluent to contravene any requirement by or under the <u>Ontario Water Resources Act</u> or the <u>Environmental Protection Act</u> (Ontario).

6. **THIS AGREEMENT MAY BE TERMINATED BY THE COMPANY** at any time on 30 days written notice sent by registered mail addressed to the __________ of the Municipality.

7. **IN THE EVENT OF A RENEWAL IF THE MUNICIPALITY GIVES WRITTEN NOTICE** sent by registered mail to the Company as aforesaid at any time within 30 days before or after the start of each calendar year, **THAT THE AMOUNT OF THE FEE OR ANY OF THE LIMITS HEREINBEFORE SET OUT ARE TO BE CHANGED** and no new agreement can be reached between the Municipality and the Company, this agreement may be terminated at the option of the Municipality at any time without notice 90 days after the registered notice was sent.

8. **EXCEPT AS HEREIN OTHERWISE EXPRESSLY PROVIDED THE COMPANY SHALL CONFORM TO THE PROVISIONS OF THE SAID BY-LAW** of the Municipality relating to the discharge of sewage and in the event of termination of this agreement the Company shall conform to the provisions of the said By-law.

9. **THE COMPANY HEREBY CONVENANTS AND AGREES TO PAY TO THE MUNICIPALITY** a fee based on an average excess suspended solids of _____ milligrams/litre, an average excess B.O.D. of _____ milligrams/litre, an average excess phenol of _____ milligrams/litre, an average excess of grease of _____ milligrams/litre, an estimated annual plant discharge of _____ cubic meters, and at a treatment cost set by the Municipality on a year to year basis.

The said fee shall become due and be paid quarter yearly on the last days of March, June, September and December in each year of any renewal until terminated as herein provided. The fee payable for the period __________________, to December 31, _____, shall be ($_______), payable in quarter yearly instalments of ($______).

10.(a) **THE COMPANY COVENANTS AND AGREES TO PAY TO THE MUNICIPALITY** on demand interest on overdue amounts at the prime rate existing for the day on which such amount is due and calculated from such date to the date of payment.

(b) **"Prime rate"** means the lowest rate of interest quoted by chartered banks to the most creditworthy borrowers for prime business loans as determined and published by the Bank of Canada in the periodic publication entitled the Bank of Canada Review.

11. **THE MUNICIPALITY MAY TERMINATE THIS AGREEMENT** at its option without notice if the Company fails for more than two months to pay an overdue amount but such termination shall not relieve the Company from its liability to make such payment.

12.(a) Where the Company has substantially reduced the quantity of the substances discharged under the terms of this agreement by reason of the installation of pretreatment facilities or a change in its processes or operations, the Company shall be entitled to a reduction in the charge so that the payments shall be based on the reduced quantity discharged.

(b) Provided that the reduction in the amount of the charge shall not take effect until 30 days from the date that the Company notifies the Municipality in writing of the change and until the Municipality has had such additional time as may be necessary in the circumstances to take samples and re-evaluate the quantity of the waste being discharged.

(c) Where it is determined that the quantity of the substances discharged under the terms of this agreement has substantially increased, the Municipality shall be entitled to increase the charge so that payments shall be based on the increased quantity discharged.

(d) Provided that the Municipality notifies the Company in writing of the increase in the amount of the charge, and the effective date of the increase.

13. THIS AGREEMENT shall enure to the benefit of, and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

IN WITNESS WHEREOF the parties hereto have hereunto affixed their Corporate Seals attested to by the hands of their respective proper officers in that behalf duly authorized.

SIGNED, SEALED AND DELIVERED in the presence of:	) MUNICIPALITY
	) ______________________
	) Municipal
	) ______________________
	) Treasurer
	) ______________________
	) ______________________

SECTION 6 SAMPLE PROGRAM APPROVAL FORM

LETTERHEAD

Address: ______________________________ Date: ____________________

Attention of: __________________________________

PROGRAM APPROVAL NUMBER ____________________________

INDUSTRIAL WASTE CONTROL

In accordance with the provision of Section _______ of ______________________________ By-law _________, we hereby approve your program and timetable for effluent quality improvement at your ______________________________ as outlined in your letter of ________________________________.

The following are the terms of this approval:

1. During the currency of this approval only, the quality of the ____(sewage, uncontaminated water, or stormwater) discharged by your Company from the said premises to the ______________________________ (sanitary, combined or storm) sewer system may exceed may exceed the limits set by By-law _________with respect to the parameters listed below provided that they shall not exceed the following limits at any time:

	parameter	limit (mg/litre)
(a)	_________	________________
(b)	_________	________________
(c)	_________	________________
(d)	_________	________________
(e)	_________	________________
(f)	_________	________________

2. The discharge of ______________________________ (sewage, uncontaminated water or stormwater) by your company from the said premises containing the parameters listed in Item 1 in excess of the limits listed in Item 1 shall constitute a contravention of this approval and thus a contravention of the said by-law.

3. This approval shall remain in force until ________________ provided the following timetable for delivery of the equipment, installation, start-up and normal operation is adhered to:

		Date of completion
(a)	delivery of equipment	__________________
(b)	installation	__________________
(c)	start-up and commissioning	__________________
(d)	normal operation	__________________

You must, however, take all necessary steps to ensure that all other conditions and parameters listed in the By-law are not exceeded, as there are no other exemptions.

We appreciate your endeavour in this pollution abatement program.

____
Director of Pollution Control

10409-03B.1
WWMS/87-1.0

APPENDIX 4

QUESTIONNAIRES USED IN INFORMATION GATHERING

QUESTIONNAIRES: EXPERIENCE IN SEWER USE CONTROL

ONTARIO MINISTRY OF THE ENVIRONMENT
EVALUATION OF MUNICIPAL SEWER USE CONTROL OPTIONS

QUESTIONNAIRES: EXPERIENCE IN SEWER USE CONTROL

1. INTRODUCTION

The Province of Ontario, Canada is currently developing policy under its MISA (Municipal - Industrial Strategy for Abatement) Program. The objective of the MISA Program is the virtual elimination of the discharge of toxic pollutants to water bodies in the Province.

Studies are currently underway to develop policy for the further control of direct industrial and municipal effluent discharges and indirect industrial discharges.

Indirect industrial effluent discharges in Ontario are via municipal sewers and municipal sewage treatment plants to the receiving water body. Normally, secondary sewage treatment using the activated sludge process is provided in Ontario municipalities with appropriate sludge management/disposal practices.

The MISA Program recognizes that further control of industrial discharges to municipal sewers/sewage treatment plants is required in Ontario. The purpose of the study "Evaluation of Municipal Sewer Use Control Options" is to develop practical and effective control options for possible use in Ontario. These options will be further evaluated by the Province using a consultative process involving provincial, municipal and industrial representatives and the public to arrive at the preferred option. The appropriate legislation and regulations will then be put in place to implement the preferred municipal sewer use control option.

The Ontario Ministry of the Environment recognizes that municipal sewer use controls have been legislated and implemented in other countries and wishes to benefit from the experience in these countries. Thus, this study "The Evaluation of Municipal Sewer Use Control Options" includes a survey of several countries' programs. Various levels of government involved with making, implementing and enforcing regulations will be surveyed.

Two questionnaires have been developed:

Questionnaire No.1	-	Aimed at levels of government responsible for regulating and/or enforcing sewer use control programs.
Questionnaire No.2	-	Aimed at municipalities responsible for implementing and possibly enforcing sewer use control programs.

The intended survey method is to mail the questionnaire ahead of time to selected individuals and to follow-up with a meeting to complete the questionnaire.

The questionnaires are quite detailed and will require time to complete. The efforts and cooperation of respondents will be greatly appreciated. The Ontario Ministry of the Environment will be pleased to cooperate with respondents in future in similar undertakings. Also, the Ministry will be pleased to make a copy of the final report an "Evaluation of Municipal Sewer Use Control Options" available to those providing information.

2. QUESTIONNAIRE NO. 1 - SEWER USE CONTROLS:REGULATIONS AND ENFORCEMENT

Preamble

This questionnaire is for the agencies that are responsible for making and enforcing the regulations governing municipal sewer use control. The questions are divided into three areas. The first is for general information. The second area is directed at the regulation maker and the third area is directed at the regulation enforcer. If your input is largely in area 2 please consider the questions in area 3 as well as vice versa.

1. GENERAL CONTACT INFORMATION

Name: ____________________

Jurisdiction: ____________________

Title: ____________________

Responsibility: ____________________

Authority Relationships
with Other Agencies: ____________________

Address: ____________________

____

Phone: ____________________

Other Information: ____________________

____

Part 2 - The Sewer Use Control Program

1. Identify the law or program that your agency has established to control sewer use, by name, and state the objective of the program. How does this law or program fit into the overall laws/programs controlling toxic discharges to the aquatic environment. (Provide a diagram.)

2. What is the legally mandated future for the law? Does the law have a fixed life in years? Are there provisions for changing the law without legislative re-authorization?

3. Is the law or program unique in controlling sewer use or are there other laws covering the same area of environmental control (layering)? In the latter case, how do the laws relate and does one or the other take precedence?

4. How does the law or program relate to the division of powers in your national system? Describe the division of powers with respect to the control of water pollution. Include a diagram of levels of power, e.g. national, state, municipal. (Provide a diagram.)

5. What is the power of your agency in the regulation making process? Is it autonomous or is it subject to outside review or is there an authority hierarchy?

6. What is the power of your agency in enforcement. Is it autonomous or do others have enforcement authority? If enforcement is delegated how is this accomplished? i.e., Who enforces regulations? (Refer to diagram in question 2.4.)

7. What is the relationship of the regulations controlling sewer use to other elements in the total waste management program? For example do you also have other regulations controlling sludge disposal, air emissions, etc.?

8. Which industries discharging to municipal sewers are regulated? All industries? Some industries? Which are? Why these industries? If not all industries, why exemptions?

9. Are industries discharging directly to receiving waterbodies also regulated? Do regulations vary with receiving body, e.g., river, lake, coastal waters? Are any industries exempted from regulations - which and why?

10. For industries discharging to municipal sewers, what is regulated in terms of the chemical content? Gross parameters? Toxics? Both? Can you provide lists of parameters and associated concentration limits? How are the lists amended/updated? Is there an on-going assessment and/or testing program that considers new data on chemicals for inclusion or exclusion from the lists?

11. For industries discharging to municipal sewers, what is the basis of the regulation? Industry basis or pollutant basis? Or a combination?

For industry basis:

- Give industrial categories and pollutants controlled together with limits.

For pollutant basis:

- Give pollutants and limits.

For combination basis:

- Give pollutants and limits.

How are the criteria given above derived, e.g., best available technology? How are the limits for pollutants discharged to sewer set, e.g., concentration, loading, combination, or loading tied to manufacturing production. Are these criteria reviewed and amended periodically? How?

12. Are the chemical standards concentration based or is loading taken into consideration? How does your regulation address the question of toxics pre-existing in the water used by an industry? Net loading? Gross loading?

13. For industrial pretreatment facilities, is the disposal of pretreatment residues (e.g., industrial sludges) controlled and how?

14. Are water quality impact assessments part of your regulatory process? Who is responsible for making such assessments?

15. What happens if more than one municipal sewage treatment plant discharges to a receiving waterbody? How is the receiving water impact assessment responsibility shared? How are the available stream loadings shared by the municipal sewage treatment plants.

16. How do the industries (contributing to a municipal sewage treatment plant via municipal sewers) share the available loading at the STP or how is it allocated to industries?

17. Do your regulations include monitoring or auditing of industrial discharges to municipal sewers?

18. What approvals or permits are required under the regulations? What procedures are required in obtaining appvoal? What onus is there on the regulator to respond to applications?

19. Are there any changes anticipated for the law as it presently stands? What new approaches are anticipated? What is the rationale behind the changes? What is the likelihood of implementation? How flexible is your regulation to changing circumstances? Are there any special "re-opener" clauses?

20. What programs do you have or are you considering for the disposal of toxics from households? e.g., Source separation programs? Special pick-ups?

21. Discuss the achievement of your program in the following areas:

    - What fraction of the planned program has been achieved?

    - Were there any technical issues raised that were not expected?

    - Have there been any legal challenges to the authority of the programs?

- To what extent are surcharges used to make allowance for non-compliance? Are such surcharges able to compensate for the non-compliance so that the overall program objectives are maintained? Consider in terms of:

  . organic loading, e.g. BOD, SS
  . toxics

- What regulatory provisions are available (e.g., special agreements, control orders) that allow non-compliance? What are the advantages and disadvantages of such exemptions?

- What is your assessment of the overall effectiveness of your regulations in meeting with your program's objectives?

22. How do your regulations or companion legislation address the recovery of costs of treatment at municipal sewage treatment plants receiving industrial wastes via municipal sewers? For example, do you use surcharges for conventional parameters such as BOD, SS, phosphorus, ammonia? What is the basis for surcharge?

23. Are such surcharges permissible for toxic pollutants? If so, under what conditions do they occur, e.g., by provision of advanced treatment at sewage treatment plant? Do your regulations provide incentives to industry for reducing toxics below regulated requirements.

24. Do your regulations provide incentives to industry for reducing toxics below regulated requirements? Did you consider economic effects of your regulations to be overall incentives or disincentives for industrial activity within your jurisdiction? Are the controls viewed as disincentives to industry and therefore are they a problem for continued economic health of the area?

25. Does the legislation permit advanced treatment at municipal sewage treatment plants with a corresponding reduction in industrial pretreatment requirements, i.e., to encourage industry to locate in this municipality.

26. If you have legislated advanced treatment, are there any repercussions, political or otherwise, in raising the necessary funding to implement the advanced treatment?

27. Did you undertake any economic impact analysis for the programs proposed by your regulations before they were promulgated? If so, was there any cost sharing considered for the costs resulting from compliance?

28. How were costs for compliance allocated? By what mechanism was the cost allocation decided upon?

29. What has been the overall effect of the regulations on sewer use control on industries?

30. How do the various industries view the sewer use controls and the associated costs to which they are subjected.

31. Are there any indications that sewer use regulations have caused industrial migration or attraction/non-attraction, e.g., because of the cost effects on industry?

32. Are there perceived regional inequities regarding cost effects of these regulations on industry, e.g., high dilution receiving waterbody?

33. What is the process for developing legislation/regulations like these? Include the roles of each party (e.g., public, industries, municipal governments, etc.) to the process.

34. Are there are differences between the process for these regulations and other types of regulation?

35. Are any aspects of the regulation not subject to the full participation of the affected parties? If so, how fair are these aspects perceived to be?

36. How does the participation in the legislation/regulation development process relate to the acceptability/effectiveness of the regulations?

37. In relation to the process you used to develop legislation/regulations for municipal sewer use control, what are the strong and weak points? What would you do differently?

Part 3 - Implementation and Enforcement

1. What resources are required for the enforcement agency to inspect, sample, analyze and carry out administrative duties under the sewer use by-law? What training and experience are considered to be necessary?

2. What is the procedure leading to a prosecution. Is the procedure effective either in ensuring compliance or in successful prosecutions and subsequent compliance.

3. How vigorously has the prosecution of the regulations been? Is there any indication that the inclination to prosecute is influenced by the strengths/weaknesses of the legislation or by other factors such as economic impacts on an industry.

4. Have prosecutions been successful? Are there any aspects of the regulation that have made prosecution difficult? Legality of sampling? Verifiability of data? Successful defences? Precendents?

5. Have any of the above affected compliance?

6. What is the penalty or fine structure? How effective is the penalty system with respect to the curtailing of on-going violations?

7. What challenges that relate to the substance of the regulations have been mounted against the regulations? What has been the cost on both sides of any challenges to the regulations?

8. What testing is required and by whom for:

   - Compliance monitoring (frequency of sampling)
   - Audit monitoring (frequency of sampling)

9. Discuss the monitoring requirements under the following headings:

   - Where are samples obtained? Manholes? On-site? Off? Other?

   - Does the enforcement agency have access to an industrial site?

   - Are plant sanitary wastes mixed in before sampling?

   - What type of sample is mandated? e.g., grab, sequential, flow proportional.

   - How is the data quality assured? Are sampling protocols specified? Are analytical methods stipulated including QA/QC program, lab pre-qualification, performance evaluation, professional certification, duplicates to the regulating agency, third party labs, blind samples?

   - Do protocols exist for legally defensible sampling?

   - Are analyses done by regulators, government labs, industries and commercial labs?

- How do lab resources meet the demand for analysis by industry? Are laboratories able to meet the standards of analyte detectability mandated by the regulation? To what extend do the industries look after their own needs?

10. How are violations detected? Regultiong agency inspection/sampling? Self-reporting? If self-reporting is used, how is it ensured?

11. What are the recordkeeping and reporting requirements? How are records kept? Manual? Computer? Are the data readily accessible? What is the reporting frequency? What is the nature of deadlines for reporting? Are QA/QC data required for the data to support the submission of results?

12. How understandable is the regulatory and enforcement program to those subject to the regultions? Does the understandability affect the effectiveness of the program?

3. QUESTIONNAIRE NO. 2 - MUNICIPAL EXPERIENCE IN SEWER USE CONTROL

Preamble

This questionnaire is divided into five parts:

Part 1 - Is aimed at obtaining information to characterize the municipality.

Part 2 - Is aimed at defining the overall role and responsibilities of the municipality in sewer use control.

Part 3 - Is aimed at obtaining specific information on the municipality's role in:

- approving industrial discharges to municipal sewers
- monitoring of industrial discharges
- record keeping
- enforcing municipal sewer use control.

Part 4 - Is aimed at determining the viewpoint of municipal staff on the impacts to municipality in implementing and/or enforcing the current sewer use control program.

Part 5 - Is aimed at determining the viewpoint of municipal staff on the effectiveness of the sewer use controls in meeting the objectives of the control program.

Part 1 - Municipal Characteristics

1. General Contact Information

Name: ______________________________

Jurisdiction: ______________________________

Title: ______________________________

Responsibility: ______________________________

Authority Relationships with Other Agencies: ______________________________

Address: ______________________________

____

Phone: ______________________________

Other Information: ______________________________

____

2. Name and population of municipality.

3. Types of industry in the municipality: please provide a description of industry types and significance. (If published data exists on industries in the municipality, e.g. by number, size and type, please provide a copy.)

4. Types of industry discharging to municipal sewers. Please provide published data if available, or a description of industrial sectors, number and size.

5. Industries discharging effluent directly to receiving water bodies, please provide a brief description by industry type or sector and size and number.

6. Municipal Sewage Treatment Plants, please provide information on:

- Capacity of municipal plant
- Treatment processes at plant
- Effluent discharge criteria at plant
- Sludge management facilities at plant
- Sludge disposal method(s) and current regulations for sludge disposal, e.g. incineration, disposal on agricultural land with limits on heavy metals, sludge disposal to landfill, composting.
- Receiving water body for municipal sewage treatment plant effluent together with any receiving body quality objectives or standards.
- Downstream users of receiving water body if significant in relation to receiving water body quality objectives or standards.
- Are there known operational problems at the municipal sewage treatment plant attributable to industrial discharges to your municipal sewers?

7. Municipal Sewage Collection System:

- Type of system, e.g. separate sanitary sewers or combined sewers?
- Is municipality responsible for planning, construction and maintenance of sewage collection system?
- Are there any significant sewers handling mainly industrial effluents?
- Are there known sewer operation/maintenance problems?

8. Ownership and operation of sewage treatment plants:

   - Owned by municipality
   - Operated by municipality
   - Owned by others
   - Operated by others

9. Organization of Municipal Department responsible for Municipal Sewage Treatment and Municipal Sewer Use Control.

   - Please provide organization chart

   - Please indicate number of staff involved in all aspects of municipal sewer use control categoraized by approvals staff; monitoring staff; enforcement staff.

Part 2 - Overall Role of Municipality in Sewer Use Control

1. Identify the law or program under which your sewer use control program operates. How is your mandate structured? Do you simply administer regulatory authority delegated from a higher level of government or do you have a choice or input into the form of regulation applied? In general, how does your program fit into the overall regulation of discharges to sewers?

2. Is the regulation unique in controlling sewer use or are there other regulations covering the same area of environmental control? Where more than one regulation applies, how do the regulations relate to one another?

3. Describe the involvement of higher levels of government in your enforcement of the regulations. What process do you go through to establish the regulatory program? Is there any overriding enforcement monitoring or prosecution by a higher level of government?

4. What is the relationship of the regulations controlling sewer use to other elements in the total waste management program? For example are there regulations controlling sludge disposal or air emissions? Briefly, who administers these regulations? Outline the relationships with higher levels of governments as requested above?

5. What is the process for developing sewer use regulations? Are you or your industries asked for input into the regulatory process, i.e. do you participate in developing these regulations?

6. Is there any difference in your involvement in developing these regulations compared with other types of regulation?

7. Are any aspects of the regulation not subject to participation by you or your industries? If so, how fair are these aspects perceived to be?

Part 3 - Questions Specific to Sewer Use Control and Role of Municipality

1. Which industries discharging to municipal sewers are regulated? All industries? Some industries? Which ones are regulated? If not all industries, why are there exemptions?

2. Are industries discharging directly to receiving waters also regulated? All? Some? Which ones? Do the regulations vary by type of receiving water body, river, lake, coastal water? For any exemptions, what is the reason?

3. What approvals or permits are required by industries under the regulations for municipal sewer use control? What procedures are required in obtaining approval, e.g. pre-approval survey of industry by municipality and negotiation relative to pollutants to be controlled. What onus does the regulation put on you to respond to applications by industries?

4. What regulatory monitoring (sampling/analysis) does your staff carry out? What monitoring is the responsibility of industry? How is the monitoring structured, e.g. compliance followed by regular auditing? Otherwise? What is the monitoring frequency for each type?

5. Do your regulations include regular monitoring or auditing of industrial discharges to sewer? Discuss the monitoring requirements under the following headings:

a) Where does your staff obtain samples. Manhole on city property? On-site manhole? Sampling point provided by industry? Other?

b) Does your staff follow legally defensible protocols for sampling and sample handling?

c) Do you have legal access to an industrial site?

d) Are industrial discharges and sanitary discharges from an industry carried to the municipal sewer in separate pipes or combined in one pipe? New industry versus established industry.

e) What type of sample does your staff collect, grab, sequential, flow proportional? What is the frequency of sampling? How does the practice compare with regulation?

f) Who analyzes the samples collected by municipal staff? Municipal lab? Commercial? Institutional? Other government agency?

g) How well do lab resources within a convenient distances meet your demand? How well is industry served for the portion of their analytical work which must be done outside their company? How well does industry meet its own demands?

h) Are labs (commercial, industrial, institutional or regulatory) able to meet the standards of analytical detectability mandated by your regulations?

i) Does your regulation require data quality assurance? Is sampling and analysis covered by any protocols? Are analytical methods stipulated including QA/QC programs, lab prequalification, performance evaluation, professional certification, replication, third party or blind samples?

6. What are the record-keeping and reporting requirements you place on industry? How are records kept by industry? Manually? Electronically? Are the data accessible? What is the reporting frequency? What deadlines are mandated? Are QA/QC data required to support the submitted data?

7. How does your staff detect violations? Your own monitoring? Reports from industry itself? If self-supporting, how do you audit the integrity of submitted data?

8. What is the penalty or fine structure? How effective is it in curtailing ongoing violations?

9. For industries discharging to municipal sewers, what is regulated in terms of chemical content? Gross parameters? Toxics? Both? Can you provide lists of parameters and associated concentration limits? What interaction do you have with higher levels of government who are responsible for such lists? Do you select, with approval, from a master list? Are you asked for feedback on the importance of the chemicals included on the lists, perhaps on the basis of usage within your jurisdiction?

10. For industries discharging to the municipal sewers, are the chemical standards "concentration-based" or is loading taken into consideration? If loading is used, is it applied at your treatment plant outfall or at individual industry discharges?

11. For industries discharging to the municipal sewers, what is the basis of the regulation? Industry (sector) basis? Pollutant basis? Combination?

    - If it is an industry or sector basis, give the industrial categories and pollutants controlled together with their limits.

    - If it is a pollutant basis, give pollutants and limits (see 9).

    - If it is a combination, give pollutants and limits appropriately.

12. How are the concentration or loading criteria determined, e.g. Best Available Technology? Are the criteria tied to production, e.g. grams of pollutant per tonne of production? If so, how? What opportunity do you have to feedback information based on your experience on the applicability of the standards to the regulatory agency?

13. Are you aware of any proposed or contemplated changes in the regulations that you apply? What new approaches are anticipated and what is the rationale for them? How flexible is the present regulation to changing circumstances? Are there any special "re-opener"

clauses to handle changes in industrial manufacturing process and pollutants discharged, or to facilitate changes in effluent criteria?

- If it is a pollutant basis, give pollutants and limits (see 9).

- If it is a combination, give pollutants and limits appropriately.

14. As operators of sewage treatment plants, are you subject to water quality impact assessment within the regulatory framework. Who is responsible for making any such assessments. Are gross loadings or net loadings used in the assessment (for details - see Part 4 of this questionnaire).

15. How do you share the available loading from your sewage treatment plant among the industries discharging to your sewer? Are gross loadings or net loadings used in the discharge assessment for industries.

16. How do you recover the costs of treatment at your sewage treatment plants receiving industrial waste? For example, do you surcharge industrial sewer users for conventional pollutants such as BOD, Suspended Solids, phosphorus or ammonia? What is the basis of the surcharge?

17. Are surcharges allowed for toxic pollutants? If so, have you made special provisions for treatment of industrial waste at your municipal sewage treament plant? Advanced Treatment? Segregation?

18. Are there cost incentives in your program for an industry to treat its wastes beyond standard requirements?

19. For industrial pretreatment facilities, is the disposal of pretreatment residues (e.g. industrial sludges) controlled and how?

20. What programs exist or are planned for the disposal of toxics from households? Source separation? Special pick-ups?

Part 4 - Impacts of Sewer Use Control Regulations on the Municipality

1. What municipal resources (staff number and costs, equipment and facilities costs) have you had to allocate to municipal sewer use control and what is your current annual allocation in the following areas:

   - Implementation of current sewer use control program, e.g. staff and equipment for pre-regulatory surveys.

   - General administration of current sewer use program - staff and facilities for issuing approvals and permits, recordkeeping and reporting to regulatory/ enforcement agency.

   - Monitoring of industrial discharges to municipal sewers - staff and equipment and laboratory facilities.

   - Enforcement of sewer use control standards - municipal inspectors and legal staff.

2. What level of qualifications is considered necessary for staff in (1) above and what training programs, if any, are or have been used? At what cost?

3. What impacts on your municipal sewage treatment plant(s) do you attribute to industrial discharges with your current sewer use control program? Please relate to effluent discharge criteria for your plant; sewage treatment processes and problems, if any; sludge management and sludge disposal practices and problems, if any.

4. What improvements or problems in the operation and effectiveness of your sewage treatment and sludge management/disposal practices have resulted from the implementation of the current municipal sewer use control program, i.e., compared to operation prior to current sewer use control program.

5. What impacts on your municipal sewage collection system (its operation and maintenance), do you attribute to the current sewer use control program? Are there any noticeable improvements or problems with your sewer system since implementing the current sewer use control program?

6. Have you identified costs to your municipality in collecting and treating industrial discharges via your municipal sewers with current sewer use control program? Please provide any cost data available.

7. How do the industries in your municipality view the sewer use control and the associated costs (resources) to which they are subjected?

8. Are there any indications that sewer use regulations have caused industrial migration or attraction/non-attraction e.g. because of cost effects on industry?

9. Do industries in your municipality perceive any inequities caused by non-uniform regulation or enforcement of discharge standards? (For example, inequities may arise from differences in receiving water quality standards from one municipality to another municipality.)

10. Were you permitted to consider economic impacts in tailoring the regulations to your municipality? Are the controls considered a disincentive to industry and, as a result, do they impact the economic health of your municipality? Are there any cost sharing programs in place to assist in compliance? If so, how were costs allocated and what mechanism was used to decide on cost allocation?

11. Are you permitted to offer advanced treatment in your sewage treatment plant with a corresponding reduction in industrial pretreatment requirements as an inducement to industry?

12. Does your program provide incentives to industry for reducing toxics below regulated requirements?

13. If advanced treatment is permitted have there been any repercussions (political or otherwise) in raising the funding necessary to implement advanced treatment?

14. In your opinion, how does participation/non-participation of industries in the regulation setting process relate to the acceptability/ effectiveness of regulations by industries.

15. In relation to the process used to develop regulations for municipal sewer use control, what are the strong and weak points? What would you do differently?

16. If more than one sewage treatment plant and/or industries discharge to the same watercourse who is responsible for the water quality impact assessment. How are the available stream loadings shared?

Part 5 - Implementation and Effectiveness of Sewer Use Control Regulations

1. How understandable is the sewer use control program to industry? Does the understandability affect the effectiveness of the program?

2. When did you start using the current controls and how did you implement these controls, i.e. implementation program and priorities?

3. Discuss the achievement of your program and any problems in implementation of the program in the following areas:

   - What fraction of the planned program has been achieved, e.g. what fraction of industry has pre-treatment?

   - Were there any technical issues raised that were not expected?

   - Have there been any legal challenges to the legal authority for the programs?

   - To what extent are municipal surcharges used to make allowance for non-compliance? Are such surcharges able to compensate for the non-compliance so that the overall program objectives are maintained? Consider in terms of:

     . organic loading, e.g. BOD, SS
     . toxics

4. What has been the overall effect of regulations on sewer use control on industries? For example, have industries willingly cooperated or have they resisted?

5. Have industries been prosecuted and found guilty of being in violation of municipal sewer use control regulations?

6. Do you consider prosecution as a last resort or as a primary enforcement tool? What role do negotiations and/or "orders to comply" have in your enforcement process and how effective are they?

7. How many violations are prosecuted in a year and what is the percentage of convictions. Do you consider this approach to be effective?

8. Any comments you may have on the effectiveness or lack of effectiveness of your control municipal sewer use control program would be appreciated. Are there any changes you would suggest or recommend?

APPENDIX 5

INDUSTRIAL CATEGORIES UNDER THE
U.S. CLEAN WATER ACT

SOURCE: GUIDANCE MANUAL FOR POTW
PRETREATMENT PROGRAM DEVELOPMENT
US EPA, OFFICE OF WATER ENFORCEMENT
AND PERMITS, OCTOBER 1983

REGULATED INDUSTRIAL SUBCATEGORIES WITH ASSOCIATED SIC CODES

Industry Category	US SIC Code
Adhesives and Sealants	2891
Aluminum Forming	
° Rolling with Emulsions	3353, 3355
° Rolling with Neat Oils	3353, 3355
° Extrusion	3354
° Drawing with Neat Oils	3353, 3355
° Forging	3463
° Drawing with Emulsions or Soaps	3353, 3355
Coal Mining	
° Coal Preparation	1111, 1112, 1211, 1213
° Acid/Ferrugenous Mine Drainage	1111, 1112, 1211, 1213
° Alkaline Mine Drainage	1111, 1112, 1211, 1213
° Areas under Reclamation	1111, 1112, 1211, 1213
° Western Coal Mines	1211, 1213
Coil Coating	
° Steel Basis Material Coating	3479
° Galvanized Basis Material Coating	3479
° Aluminum Basis Material Coating	3479
Copper Forming	
° Hot Rolling	3351
° Cold Rolling	3351
° Extrusion	3351
° Drawing	3351
° Pickling	3351
° Alkaline Cleaning	3351
° Forging	3351
° Copper Foil Production	3497, 3351
Electroplating (Metal Finishing)	3471 & 3479
° Electroplating of Common Metals	(Some industries within these subcategories may not be subject to regulations)
° Electroplating of Precious Metals	
° Electroplating of Speciality Metals	
° Anodizing	
° Coatings	
° Chemical Etching & Milling	

- Electroless Plating
- Printed Circuit Board
- Chemical Matching
- Immersion Plating
- Pickling
- Bright Dipping
- Alkaline Cleaning

Foundries

° Iron and Steel	3322, 3324, 3325
° Copper	3362
° Aluminum	3361
° Zinc	3369
° Lead	3369
° Magnesium	3369

Inorganic Chemicals

° Chlorine & Na or K Hydroxide	2812
° Hydrofluoric Acid Production	2819
° Na Dichromate & Sulfate Production	2819
° Titanium Dioxide	2816
° Aluminum Fluoride Production	2819
° Chrome Pigment	2816
° Copper Sulfate Production	2819
° Hydrogen Cyanide Production	2819
° Nickel Sulfate Production	2819
° Sodium Bisulfite Production	2819
° Sodium Silicofluoride Production	2819

Iron and Steel Manufacturing
(BAT subcategorization scheme)

° Cokemaking	3312
° Sintering	3312
° Ironmaking	3312
° Steelmaking	3312
° Vaccum Degassing	3312
° Continuous Casting	3312
° Hot Forming	3312, 3315, 3317[1]
° Scale Removal	3312, 3315, 3317[1]
° Acid Pickling	3312, 3315, 3317[1]
° Cold Forming	3316
° Alkaline Cleaning	3312, 3315, 3316, 3317[1]
° Hot Coating	3312, 3315, 3317[1]

Leather Tanning and Finishing

°	Hair Pulp Unhairing with Chrome Tanning and Finishing	3111
°	Hair Save Unhairing with Chrome Tanning or Finishing	3111
°	Unhairing with Vetetable or Alum. Tanning and Finishing	3111
°	Finishing of Tanned Hides	3111
°	Vetetable of Chrome Tanning of Unhaired Hides	3111
°	Unhairing with Chrome Tanning and No Finishing	3111
°	Shearing	3111

Pharmaceutical Manufacturing

°	Fermentation Products	2833, 2831
°	Extractions	2831, 2833
°	Chemical Synthesis Products	2833
°	Mixing/Compounding - Formation	2834
°	Research	2831, 2833, 2834

Plastics and Synthetics (Organic Chemicals, Plastics, Synthetic Materials)

°	Polyvinyl Chloride	2821
°	Polyvinyl Acetate	2821
°	Polystyrene	2821
°	Polypropylene	2821
°	Polypropylene	2821
°	Cellophane	2821
°	Rayon	2823
°	ABS and SAN Resin - Copolymers	2821
°	Polyester	2821
°	Nylon 6	2821
°	Cellulose Acetate	2823
°	Acrylics	2821
°	Ethylene - Vinyle Acetate	2821
°	Polytetrafluoroethylene	2821
°	Polypropylene Fiber	2823
°	Alkyds & Unsaturated Polyester Resins	2821
°	Cellulose Nitrate	2821
°	Polyamide (Nylon 6/12)	2821
°	Polyester Resins (Thermoplastics)	2821
°	Silicones	2821

Porcelain Enameling

°	Steel	3631, 3632, 3633, 3639, 3469, 3479, 3431

° Cast Iron	Mainly 3631, 3431
° Aluminum	Mainly 3469, 3479, 3631
° Copper	Mainly 3479, Limited use in 3469 and 3631

Pulp, Paper and Paperboard

° Unbleached Kraft	2611
° Sodium Based neutral Sulfite Semi-Chemical	2611
° Ammonia Based Neutral Sulfite Semi-Chemical	2611
° Unbleached Kraft-Neutral Sulfite Semi-Chemical	2611
° Paperboard from Wastepaper	2631
° Dissolving Kraft	2611
° Market Bleached Kraft	2611
° OCT Bleached Kraft	2611
° Fine Bleached Kraft	2611
° Paperboard Sulfite	2611, 2621
° Dissolving Sulfite Pulp	2611
° Groundwood - Thermo - Mechanical	2611, 2621
° Groundwood - CMN Papers	2611, 2621
° Groundwood - Fine Papers	2611, 2621
° Soda	2611, 2621
° Unbleached Kraft & Semi-Chemical	2611
° Semi-Chemical	2611
° Wastepaper - Molded Products	2646
° Nonintegrated - Lightweight Paper	2621
° Nonintegrated - Filter and Nonwoven Papers	2621
° Nonintegrated - Paperboard	2631
° Deink	2611, 2621
° Nonintegrated Fine Paper	2621
° Nonintegrated Tissue Papers	2631
° Tissue from Wastepaper	2647
° Papergrade Sulfite (Drum Wash)	2611, 2621

Steam Electric Power Generating

° Generating Unit	4911, 4931
° Small Unit	4911, 4931
° Old Unit	4911, 4931
° Area Runoff	4911, 4931

Textile Industry

° Wood Scouring	2299
° Wool Finishing	2231

° Knit Fabric Finishing	2251-59
° Carpet Mills	2271, 2272, 2279
° Stock and Yarn Dyeing & Finishing	2269
° Nonwoven Manufacturing	2297
° Felted Fabric Processing	2291

Timber Products

° Wood Preserving - Boultonizing	2491
° Wood Furning and Fixtures (with and Without Water Wash Spray Booths or Laundry Facilities)	2511, 2512, 2517, 2521 2531, 2541

APPENDIX 6

PRIORITY POLLUTANT LISTING

UNDER THE

CLEAN WATER ACT

SOURCE: AS APPENDIX 5

APPENDIX 6

PRIORITY POLLUTANT LISTING UNDER THE CLEAN WATER ACT

PRIORITY POLLUTANT[a]

1. acenaphthene
2. acrolein
3. acrylonitrile
4. benzene
5. benzidine
6. carbon tetrachloride
7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
10. 1,1-dichloroethane
11. 1,1,1-trichloroethane
12. Hexachloroethane
13. 1,2-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloroethyl) ether
18. 2-chloroethyl vinyl ether (mixed)
19. 2-chloronaphthalene
20. 2,3,6-trichlorophenol
21. parachlorometa cresol
22. chloroform (trichloromethane)
23. 2-chlorophenol
24. 1,2-dichlorobenzene
25. 1,3-dichlorobenzene
26. 1,4-dichlorobenzene
27. 3,3-dichlorobenzidine
28. 1,1-dichloroethylene
29. 1,2-trans-dichloroethylene
30. 2,4-dichlorophenol
31. 1,2-dichloropropane
32. 1,2-dichloropropylene (trans 1,3-dichloropropene)
33. 2,4-dimethylphenol
34. 2,4-dinitrotoluene
35. 2,6-dinitrotoluene
36. 1,2-diphenylhydrazine
37. ethylbenzene
38. fluoranthene
39. 4-chlorophenyl phenyl ether
40. 4-bromophenyl phenyl ether

APPENDIX 6
PRIORITY POLLUTANT LISTING UNDER THE CLEAN WATER ACT
(continued)

PRIORITY POLLUTANT[a]

41. bis (2-chlorisopropyl) ether
42. bis (2-chloroethoxy) methane
43. methylene chloride (dichloromethane)
44. methyl chloride (chloromethane)
45. methyl bromide (bromomethane)
46. bromoform (tribromomethane)
47. dichlorobromomethane
48. chlorodibromomethane
49. hexachorobutadiene
50. hexachlorocyclopentadiene
51. isophorone
52. naphthalene
53. nitrobenzene
54. nitrophenol
55. 4-nitrophenol
56. 2,4-dinitrophenol
57. 4,6-dinitro-o-cresol
58. N-nitrosodimethylamine
59. N-nitrosodiphenylamine
60. N-nitrosodi-n-propylamine
61. pentachlorophenol
62. phenol
63. bis (2-ethylhexyl) phthalate
64. butyl benzyl phthalate
65. di-n-butyl phthalate
66. di-n-octyl phthalate
67. diethyl phthalate
68. dimethyl phthalate
69. benzo (a) anthracene (1,2-benzanthracene)
70. benzo (a) pyrene (3,4-benzopyrene)
71. 3,4-benzofluorantnene
72. benzo (k) fluoranthane (11, 12-benzofluoranthene)
73. chrysene
74. acenaphthylene
75. anthracene
76. benzo (ghi) perylene (1, 12-benzoperylene)
77. fluorene
78. phenanthrene
79. dibenzo (a,h) anthracene (1,2,5,6-dibenzanthracene)
80. indeno (1,2,3-cd) pyrene (2,3-o-phenylenepyrene)
81. pyrene
82. tetrachloroethylene
83. toluene
84. trichloroethylene

APPENDIX 6

PRIORITY POLLUTANT LISTING UNDER THE CLEAN WATER ACT

PRIORITY POLLUTANT[a]

1. acenaphthene
2. acrolein
3. acrylonitrile
4. benzene
5. benzidine
6. carbon tetrachloride
7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
10. 1,1-dichloroethane
11. 1,1,1-trichloroethane
12. Hexachloroethane
13. 1,2-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloroethyl) ether
18. 2-chloroethyl vinyl ether (mixed)
19. 2-chloronaphthalene
20. 2,3,6-trichlorophenol
21. parachlorometa cresol
22. chloroform (trichloromethane)
23. 2-chlorophenol
24. 1,2-dichlorobenzene
25. 1,3-dichlorobenzene
26. 1,4-dichlorobenzene
27. 3,3-dichlorobenzidine
28. 1,1-dichloroethylene
29. 1,2-trans-dichloroethylene
30. 2,4-dichlorophenol
31. 1,2-dichloropropane
32. 1,2-dichloropropylene (trans 1,3-dichloropropene)
33. 2,4-dimethylphenol
34. 2,4-dinitrotoluene
35. 2,6-dinitrotoluene
36. 1,2-diphenylhydrazine
37. ethylbenzene
38. fluoranthene
39. 4-chlorophenyl phenyl ether
40. 4-bromophenyl phenyl ether

APPENDIX 6
PRIORITY POLLUTANT LISTING
UNDER THE
CLEAN WATER ACT
(continued)

PRIORITY POLLUTANT[a]

41. bis (2-chlorisopropyl) ether
42. bis (2-chloroethoxy) methane
43. methylene chloride (dichloromethane)
44. methyl chloride (chloromethane)
45. methyl bromide (bromomethane)
46. bromoform (tribromomethane)
47. dichlorobromomethane
48. chlorodibromomethane
49. hexachorobutadiene
50. hexachlorocyclopentadiene
51. isophorone
52. naphthalene
53. nitrobenzene
54. nitrophenol
55. 4-nitrophenol
56. 2,4-dinitrophenol
57. 4,6-dinitro-o-cresol
58. N-nitrosodimethylamine
59. N-nitrosodiphenylamine
60. N-nitrosodi-n-propylamine
61. pentachlorophenol
62. phenol
63. bis (2-ethylhexyl) phthalate
64. butyl benzyl phthalate
65. di-n-butyl phthalate
66. di-n-octyl phthalate
67. diethyl phthalate
68. dimethyl phthalate
69. benzo (a) anthracene (1,2-benzanthracene)
70. benzo (a) pyrene (3,4-benzopyrene)
71. 3,4-benzofluorantnene
72. benzo (k) fluoranthane (11, 12-benzofluoranthene)
73. chrysene
74. acenaphthylene
75. anthracene
76. benzo (ghi) perylene (1, 12-benzoperylene)
77. fluorene
78. phenanthrene
79. dibenzo (a,h) anthracene (1,2,5,6-dibenzanthracene)
80. indeno (1,2,3-cd) pyrene (2,3-o-phenylenepyrene)
81. pyrene
82. tetrachloroethylene
83. toluene
84. trichloroethylene

APPENDIX 6
PRIORITY POLLUTANT LISTING
UNDER THE
CLEAN WATER ACT
(continued)

PRIORITY POLLUTANT[a]

85. vinyl chloride (chloroethylene)
86. aldrin
87. dieldrin
88. chlordane (technical mixture and metabolites)
89. 4, 4'-DDT
90. 4, 4'-DDE (p, p'-DDX)
91. 4, 4'-DDD (p, p'-TDE)
92. alpha-endosulfan
93. beta-endosulfan
94. endosulfan sulfate
95. endrin
96. endrin aldehyde
97. heptachlor
98. heptachlor epoxide
99. alpha-BHC
100. beta-BHC
101. gamma-BHC (lindane)
102. delta-BHC
103. PCB-1242 (Arochlor 1242)
104. PCB-1254 (Arochlor 1254)
105. PCB-1221 (Arochlor 1221)
106. PCB-1232 (Arochlor 1232)
107. PCB-1248 (Arochlor 1248)
108. PCB-1260 (Arochlor 1260)
109. PCB-1016 (Arochlor 1016)
110. toxaphene
111. antimony (total)
112. arsenic (total)
113. asbestos (fibrous)
114. beryllium (total)
115. cadmium (total)
116. chromium (total)
117. copper (total)
118. cyanide (total)
119. lead (total)
120. mercury (total)
121. nickel (total)
122. selenium (total)
123. silver (total)
124. thallium (total)
125. zinc (total)
126. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

APPENDIX 6
PRIORITY POLLUTANT LISTING
UNDER THE
CLEAN WATER ACT
(continued)

a. Thus numbering does not correspond with numbers on EPA's list of priority pollutants.

Source: "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268. EPA-600/4-82-057. July 1982.

This table lists the analytical methods and appropriate detection limits for the EPA priority pollutants. The information contained in "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater" represents an effort to provide procedures that are as uniform and cost effective as practical for a wide cross-section of chemical compound classes. Due to the variable chemical and physical properties of the parameters, some compromises had to be made. Therefore, in some of the methods, the extraction procedures, clean-up procedures and determinative steps are not optimum for all parameters.

APPENDIX 7
EUROPEAN COMMUNITY TARGETS
FOR
LIST I AND LIST II
COMPOUNDS

SOURCE: PRIORITIES FOR STUDY AND ACTION ON
LIST I SUBSTANCES, EW WOLF, 947-M/1
JUNE 1985, WRc (WATER RESEARCH)
ENVIRONMENT

APPENDIX 7

E.C. POTENTIAL LIST I COMPOUNDS

No.	Compound
1.	ALDRIN
2.	2-AMINO-4-CHLOROPHENOL
3.	ANTHRACENE
4.	ARSENIC AND ITS MINERAL COMPOUNDS
5.	AZINPHOS-ETHYL
6.	AZINPHOS-METHYL
7.	BENZENE
8.	BENZIDINE
9.	BENZYL CHLORIDE
10.	BENZYLIDENE CHLORIDE
11.	BIPHENYL
12.	CADMIUM AND ITS COMPOUNDS
13.	CARBON TETRACHLORIDE
14.	CHLORAL HYDRATE
15.	CHLORDANE
16.	CHLOROACETIC ACID
17.	2-CHLOROANILINE
18.	3-CHLOROANILINE
19.	4-CHLOROANILINE
20.	CHLOROBENZENE
21.	1-CHLORO-2, 4-DINITROBENZENE
22.	2-CHLOROETHANOL
23.	CHLOROFORM
24.	4-CHLORO-3-METHYLPHENOL
25.	1-CHLORONAPHTHALENE
26.	CHLORONAPHTHALENES
27.	4-CHLORO-2-NITROANILINE
28.	1-CHLORO-2-NITROBENZENE
29.	1-CHLORO-3-NITROBENZENE
30.	1-CHLORO-4-NITROBENZENE
31.	4-CHLORO-2-NITROTOLUENE
32.	CHLORONITROTOLUENES
33.	2-CHLOROPHENOL
34.	3-CHLOROPHENOL
35.	4-CHLOROPHENOL
36.	CHLOROPRENE
37.	3-CHLOROPROPENE
38.	2-CHLOROTOLUENE
39.	3-CHLOROTOLUENE
40.	4-CHLOROTOLUENE
41.	2-CHLORO-P-TOLUIDINE
42.	CHLOROTOLUIDINES
43.	COUMAPHOS
44.	CYANURIC CHLORIDE

APPENDIX 7
E.C. POTENTIAL LIST I COMPOUNDS
(continued)

No.	Compound
45.	2, 4-D
46.	DDT (INCLUDING METABOLITIES DDD AND DDE)
47.	DEMOTON
48.	DIBROMOETHANE
49.	DIBUTYLTINCHLORIDE
50.	DIBUTYLTINOXIDE
51.	DIBUTYLTIN SALTS
52.	DICHLOROANILINES
53.	1, 2-DICHLOROBENZENE
54.	1, 3-DICHLOROBENZENE
55.	1, 4-DICHLOROBENZENE
56.	DICHLOROBENZIDINES
57.	DICHLORODIISOPROPYL ETHER
58.	1, 1-DICHLOROETHANE
59.	1, 2-DICHLOROETHANE
60.	1, 1-DICHLOROETHYLENE
61.	1, 1-DICHLOROETHYLENE
62.	1, 2-DICHLOROETHYLENE
63.	DICHLOROMETHANE
64.	2, 4-DICHLOROPHENOL
65.	1, 2-DICHLOROPROPANE
66.	1, 3-DICHLOROPROPAN-2-OL
67.	1, 3-DICHLOROPROPENE
68.	2, 3-DICHLOROPROPENE
69.	DICHLORPROP
70.	DICHLORVOS
71.	DIELDRIN
72.	DIETHYLAMINE
73.	DIMETHOATE
74.	DIMETHYLAMINE
75.	DISULFOTON
76.	ENDOSULFAN
77.	ENDRIN
78.	EPICHLOROHYDRIN
79.	ETHYLBENZENE
80.	FENITROTHION
81.	FENTHION
82.	HEPTACHLOR (INCLUDING HEPTACHLOREPOXIDE)
83.	HEXACHLOROBENZENE
84.	HEXACHLOROBUTADIENE
85.	HEXACHLOROCYCLOHEXANE (INCLUDING ALL ISOMERS AND LINDANE)
86.	HEXACHLOROETHANE
87.	ISOPROPYLBENZENE

APPENDIX 7
E.C. POTENTIAL LIST I COMPOUNDS
(continued)

No.	Compound
88.	LINURON
89.	MALATHION
90.	MCPA
91.	MECOPROP
92.	MERCURY AND ITS COMPOUNDS
93.	METHAMIDOPHOS
94.	MEVINPHOS
95.	MONOLINURON
96.	NAPHTHALENE
97.	OMETHOATE
98.	OXDEMETON-METHYL
99.	PAH
100.	PARATHION
101.	PCB
102.	PENTACHLOROPHENOL
103.	PHOXIM
104.	PROPANIL
105.	PYRAZON
106.	SIMAZINE
107.	2, 4, 5-T
108.	TETRABUTYLTIN
109.	1, 2, 4, 5-TETRACHLOROBENZENE
110.	1, 1, 2, 2-TETRACHLOROETHANE
111.	TETRACHLOROETHYLENE
112.	TOLUENE
113.	TRIAZOPHOS
114.	TRIBUTYL PHOSPHATE
115.	TRIBUTYLTIN OXIDE
116.	TRICHLOROFON
117.	TRICHLOROBENZENE
118.	1, 2, 4-TRICHLOROBENZENE
119.	1, 1, 1-TRICHLOROETHANE
120.	1, 1, 2-TRICHLOROETHANE
121.	TRICHLOROETHYLENE
122.	TRICHLOROPHENOLS
123.	1, 1, 2-TRICHLOROTRIFLUOROETHANE
124.	TRIFLURALIN
125.	TRIPHENYLTIN ACETATE
126.	TRIPHENYLTIN CHLORIDE
127.	TRIPHENYLTIN HYDROXIDE
128.	VINYL CHLORIDE
129.	XYLENES